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DEVELOPMENT OF A PRIORITY DETERMINATION PROCEDURE

Rivkin/Carson, Incorporated

Prepared for:

Appalachian Regional Commission

March 1972

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Development of a Priority Determination Procedure

Rivkin/Carson and Arthur Edwards Associates
Washington, D.C.

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PRIORITY DETERMINATION PROCEDURE
For the Selection of Pollution Abatement Projects in the Monongahela River Basin

Prepared for
Appalachian Regional Commission
Contract 72-67/CP-043

by
Rivkin/Carson, Inc.
with Arthur W. Edwards Associates
March, 1972

PREAMBLE

To the Reader:

This report contains an itemization of the various factors which were deemed to be useful in evaluating the socio-economic-environmental influences which could be considered in listing pollution abatement projects in priority order. It is assumed that most of the information and data necessary for the priority setting scheme described in this report will be or is available. Another consultant will utilize the procedure described here during the next several months. Experience during this period may indicate that additional or alternative factors should be or could be considered or that factors listed in this report should be disregarded as temporarily unavailable or temporarily unworkable.

Your views on the scheme developed in this document, as well as the experience gained as described above, will be considered in improving this report which should be considered a "working document."

The Appalachian Regional Commission

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CHAPTER ONE: INTRODUCTION

I. Purpose of the Abatement Program and Principles of the Priority Procedure

The Appalachian Regional Commission in cooperation with the States of Maryland, Pennsylvania, and West Virginia is embarking on a major pollution abatement program in the Monongahela River Basin. To mount the program, the three states and the Commission require a structured framework which they can use for investment decisions and program implementation toward environmental improvement and economic development of the Basin.

The guiding principle adopted in the development of the priority determination procedure conforms with the Commission's primary objective - that public investments be made to support and stimulate economic development. The Commission's investments, whether in public works, human resources, or natural resources, are made toward the achievement of one goal - the economic development of this lagging region. Investments are not made on a single purpose basis but are measured by their contribution to area development.

The pollution abatement program in the Monongahela Basin is not contemplated simply as an environmental improvement activity but is seen as an additional project to help stimulate the economy of this part of the region. This, despite the fact that there is no empirical evidence to prove that a "cleaner" environment improves the economic potential of an area. While people everywhere desire a pleasanter living environment, it is difficult to establish the direct link between economic growth and "environmental quality," if for no other reason than the problem of quantifying "environmental quality." However, inferences have been drawn from migration analyses suggesting that the movements to climatically favorable areas and to coastal locations indicate environmental preferences, at least for those able and qualified to move.

A major premise underlying current public expenditures and regulations is that environmental degradation has gone too far, must be stopped, and ought to be reversed. The awareness of environmental quality has established a climate of opinion in which environmental considerations are regarded as development factors. Since the Monongahela Basin is in part a heavily polluted area it finds itself in this regard at a severe disadvantage.

If environmental improvements are likely to have beneficial effects which enhance economic prospects they must be felt where the economic activity occurs - at centers of present industrial and commercial enterprise, at those centers where opportunities for growth exist, and at locations where the quality of the natural environment is the major factor for employment and income, i.e. outdoor recreation areas.

Emphasis is, therefore, placed in the priority determination procedure on these economic activity factors to assure that pollution abatement projects are guided to (1) where people live and work, (2) where growth potential exists, (3) where "policy inspired" investments have previously been made in support of growth, and (4) where the natural environment needs protection at existing and proposed recreation areas.

The product of the short (two months) but intensive study is a recommended method for selecting pollution abatement projects or "action packages" in the Monongahela River Basin according to explicit priorities. In the development of the procedure we have found it useful to distinguish between two sets of considerations which form the basis for the detailed method of ordering the priorities. These considerations are discussed in the following section and they deal with (1) matters relating to the nature of pollution, i.e. the variety and uneven distribution of pollution, the differences in the effects of pollution, and therefore, the need for specific and quite detailed information in order to select abatement activities which produce the desired results, and (2) matters relating to policy, i.e. pollution abatement objectives as expressed in institutional, financial, and legal arrangements.

The recommended procedure is at once ambitious in scope and, given adequate and reliable information, simple in use. It constitutes a balance between full consideration of major priority factors and attention to the practicality of operating the procedures. Yet the results of our work must be put into perspective. Too often expectations are raised too high, with disappointing consequences. We wish to be accurate and precise about what the product is.

The Commission's attempt to find a rational method of fund allocation for pollution abatement which considers both environmental and economic development factors enters into a new field where much is unknown and where existing methods are crude. It should be realized that not only must the relevant facts be available and be honestly assessed but there are several steps at which judgments have to be made about the relative importance of the facts. In the absence of acceptable

measures for considering the relative effects of dissimilar pollutants or of rating environmental protection efforts, there is danger of excessive arbitrariness in assigning values.

While a priority procedure is forced to use numbers for weighting and ranking of the different factors, the numbers should not rule the system. We suggest number values at many places where judgment substitutes for scientific measurement. These numbers can be readily changed without, however, affecting the structure of the procedure. The framework of the procedure is built on an understanding of the public objectives. That does not imply that the weights assigned to the objectives are fixed.

The procedure is also able to adjust to policy changes. For example, the growth center principle forms part of the Commission's development strategy and the states have designated a number of towns as growth centers. Conceivably, the centers designated may change. Such changes would automatically find adjustment in the procedure. Alternatively, new policy decisions relating to economic development or environmental quality which may be adopted in the future may be easily accommodated in the priority procedure by substitution of factors or by changed weighting of factors now in the system.

We would also mention that the information required to use the procedure will be less than perfect at the beginning of the comprehensive program for pollution abatement in the Monongahela River Basin. This does not make the procedure unworkable, it just means that in the early stages more informed judgment is required, but within the procedure's framework. It will not be necessary to make ad hoc decisions until all the facts are in.

This report, aside from establishing the priority procedure, also specifies the data needed to use the procedure. Most of the data exist, even though not all of it has been assembled and recorded in a form directly usable for the procedure. Other information will have to be collected.

The procedure is part of a total comprehensive environmental improvement program currently under preparation by the Commission. The other elements are the provision of standard cost estimates for various abatement works, provision of pollution data, and the development of the program itself which combines pollution and cost data with the priority procedure.

Since much of the relevant information has not been put together yet there will be need for testing and adjusting of the procedure before a final program can be established which does in fact employ the desired priorities.

II. Characteristics of Pollution Abatement

The primary purpose of this report is to present and explain the priority determination procedure, to specify the data required for the procedure, and to explain how it is to be used. In the development of the procedure we were concerned with linking pollution abatement to economic development. We were not directly concerned with policy determinations about environmental objectives, legal problems of environmental degradation control, and evaluation of environmental quality standards.

While, therefore, these important issues are not analyzed in this study, they could not be ignored entirely. One is forced to consider them when dealing with priorities. By definition, priorities must relate to objectives, and this relationship is clarified here.

The varied occurrence and effects of pollution pose a number of issues for an abatement program, and these issues are best explained before the priority procedure is presented.

The final purpose of this section is to lay out the groundrules adopted for the procedures as a result of our understanding of the issues discussed here.

A. Abatement Priorities and Pollution Information. Superficially it may appear that the procedure relies for its proper functioning on an unnecessarily extensive data base. The question may be asked why so much pollution information is needed. The justification is that unless it is known (1) where the pollution comes from, (2) how much is generated at each location, (3) how wide an area is affected, it is difficult, if not impossible, to make any abatement project decisions based on priorities.

We recommend the approach to priority setting be comprehensive and systematic, but also selective. Rather, the inventories

are to establish the context in which the pollution exists and in which amelioration efforts must occur. We focus on salient features of this context.

The pollution status survey must be the most thorough and complete of the three inventories. Economic and demographic significance and level of effort analyses, (the other two) are envisioned more in the nature of profiles.

We have specified indicators which we believe are pertinent to the issues the Appalachian Regional Commission faces in its pollution abatement funding. The list of indicators may be modified as conditions change. Experience in using the priority procedure will also permit greater refinement.

B. Abatement Priorities and Environmental Objectives. We have said already that objectives are essential for priority determination. In addition, environmental objectives must be fairly specific. It is not sufficient merely to express a general desire for environmental improvement. Different pollutants have varying effects on the environment and the degree of "clean-up" desired depends on the nature, magnitude, and impact of the pollutant, and on the local or regional circumstances under which it occurs as well as the costs of clean-up.

The more specific the environmental objectives, as expressed in quality standards, the easier the priority determination. Unfortunately, the development and adoption of quality standards is still in an evolutionary stage. No generally acceptable method has been instituted. The trend is toward more stringent or inflexible methods of controlling environmental degradation.

In the case of water, which is perhaps the most seriously polluted natural resource in the Monongahela Basin, two distinct standards are being advocated - background standards and site standards. Background standards relate to the quality of the receiving waters, i.e. the effluent permitted into the stream is dependent on the volume and quality of the water in the receiving stream. Site standards, on the other hand, relate to the effluent standard regardless of the nature of the receiving waters, i.e. they constitute a direct control on what is permitted to leave the pollution source site. Currently the move is from background to site standards and perhaps for two reasons: First, the new awareness about the intensity of environmental degradation and its effects have lead to a reaction and to the advocacy of the principle of non-pollution, i.e. the complete elimination of draining

pollution into streams; the second reason for the preference of site standards is that as a "control" standard it is easier to administer.

This is not the project in which to assess the merits of either approach. But it is important to realize that both standards exist at present side by side. For example, industrial waste is generally regulated under background standards and mine acid from active mines under site standards. (And mine acid from inactive mines is not regulated at all.)

Since standards will change we have chosen to use current standards as the yardstick for the priority procedure. This means for air and land pollution whatever site standards exist, and for water the prescribed background standards. Each of the three states has designated water uses and water quality criteria for all streams in the Monongahela River Basin. These standards are accepted for the priority determination as the quality objectives, since the standards are as yet unrealized. The difference between the present water quality and the designated standard is the measure of the pollution to be abated in the different stretches of the streams.

C. Abatement Priorities and the Law. As in the case of objectives, the priority procedure is not intended to deal with environmental laws, but it is necessary to understand the implication of laws on abatement programs and on the priorities determining public investment in abatement projects.

There is a long history concerning attempts to use the common law to control environmental degradation, and of the inability of the common law to do so. 1/ This inability has lead to legislative intervention to establish duties and liabilities for the prevention of pollution. New laws determine who pays for the preservation of environmental quality and to what extent, in economic terms, operators are required to internalize the full cost of their operation.

It is no secret that it costs money for human activities to be performed in a "clean" manner. To reduce or prevent pollution, whether from mining, industrial and commercial enterprises, or from ordinary

1/ Everett F. Goldberg and Garrett Power, Coal and the Environment, Legal Problems of Reclamation in Maryland, Ohio, Pennsylvania and West Virginia. Environmental Protection Agency, Draft Final Report, November, 1971.

domestic life, is costly. If society insists on a cleaner environment it has to pay for it, and we are all aware by now that as members of society we have to pay for it in our different roles - as tax payers, as consumers or both. The degree to which we may shift responsibility for payment is a political matter, as is the allocation of abatement benefits to different geographic locations.

Presumably, it is not the desire of the Appalachian Regional Commission to become the arbiter for resolving the question of "internalization of costs" of different polluting operations. However, since the Commission intends to allocate public funds for pollution abatement, it cannot ignore the requirements of the law. If limited public funds are allocated for pollution abatement in the hope of maximizing benefits within a framework of priorities which respect public objectives, should not consideration be given also to the full use of available legal powers which are directed toward the same objectives?

Mine acid drainage and siltation affords a good example of such considerations. Mine acid drainage comes from both active and inactive mines. The extensive survey and testing done by the Enforcement Conference established that about one third of the mine acid in the streams of the Monongahela Basin drains from active mines. The laws require control of mine acid drainage from active mines but not from inactive mines. Consequently, the cost of abatement from inactive mines is met by the taxpayers and the cost of abatement from active mines, in as far as it is done, is paid for by the mine operators.

The proportion of mine drainage from active mines varies considerably within the basin. Along some tributaries active mines contribute more than a third of the mine acid, along others less. From experience it appears that the designated water quality, in terms of pH, can be achieved in some tributaries by ensuring that the active mines are operated properly. This seems to be the lesson learned by the Elk Creek Water Pollution Association, a voluntary association of private citizens who took the trouble to keep a close watch on mine drainage. The 1965-66 pH level (2.4-6.3) was well below the standard (6.0-8.5). Today, after continued watch over the last three years and successful prosecutions, the level is around 7.5.

Mine drainage information is well documented to allow this kind of judgment about law enforcement to be made. An equal inventory of industrial wastes does not exist. Limited samplings in Pennsylvania by the State Department of Environmental Resources, the Environmental Protection Agency, and by university faculty and students clearly indicates widespread violations of clean stream laws. In November, 1971, on-water sampling along the Monongahela River established (1) there are

discharge points not covered by permits as required by law, and (2) a high proportion of those points with permits were discharging pollutants in violation of the permits.

Priorities should not determine responsibilities for abatement of specific types of pollutants and pollution sources; the laws of the day establish required responsibilities for the cost of abatement under different circumstances. Public investment priorities must, however, balance public responsibilities with private responsibilities. Our concern is to prescribe a method for identifying pollution abatement priorities regardless of "responsibilities." It is for the Appalachian Regional Commission to determine the relative emphasis to be placed, from year to year, on pollution efforts in the private and the public sector based on two considerations - the seriousness of the pollution, and the benefits to economic development resulting from abatement.

D. Abatement Priorities and the Nature of Pollution. The briefest survey and analysis of pollution in a river basin like the Monongahela Basin leads to the recognition of the multifaceted nature of environmental pollution - its diversity, its sporadic and at the same time concentrated appearance, as well as its sporadic and concentrated effect.

Pollution sources are unevenly distributed and pollution effects are unevenly felt. Large areas in the Monongahela River Basin are relatively or completely pollution free, others are heavily polluted. In short, the relationships between pollution sources and pollution affected areas are both direct but not always obvious.

Whether the pollution is intense or not its effect may be geographically limited or it may affect communities and activities far removed from its source. This raises great difficulties for priority selection, and emphasizes the need for selective abatement action which produces benefits in areas of economic activity. While pollution sources have to be found, the pollution to be abated must be restricted to that which affects selected areas. This problem can be explained further by discussing the conflict of areas.

E. Abatement Priorities and the Conflict of Areas. A special difficulty in establishing a priority rating system is directly attributable to the diversity of pollution and the variability of pollution effects.

Because of its central importance to the scheme it is necessary to understand the difficulty so that later changes and adjustments to

the priority rating method can take account of the "area problem." Briefly, four kinds of areas must be kept in mind; they relate to:

1. Where the pollution originates (and the types and magnitude of it) - Pollution Source Area.

2. The area affected by the pollution - Pollution Impact Area.

3. The significance of the pollution effect - Pollution Abatement Importance Area.

4. The area or jurisdiction of abatement effort - Pollution Abatement Effort Area.

While these areas are obviously related, the four types of areas overlap in an infinite variety, considering the range of pollutants. The pollution sources are widespread and not directly related to the settlement pattern of the basin. The impact area of a given pollutant differs from purely local to basin-wide. The pollution abatement importance differs too; the same type of source with the same pollution impact has not necessarily the same significance since the importance of the impact depends on the size and nature of the community affected. Finally, the effort areas differ too. The concern for the environment and the ability to pay for pollution abatement vary from community to community. But in any case, regardless of concern and financial capability, the "effort community" can only treat the pollution in its area which may in fact degrade the environment in another community.

It is this area problem which complicates the priority determination procedure and makes it as complex as it is.

III. The Groundrules for the Priority Procedure

The discussion of the issues emphasized the necessity for clearly stated objectives, standards and criteria, and it indicated our preferences. To avoid repetitious explanations of assumptions in the exposition of the priority determination procedure, the adopted groundrules are set out here together. All of them flow directly from three basic objectives, and each component of the priority procedure is justified by reference to the three basic objectives.

A. Basic Abatement Objectives

1. Project investments for abatement and elimination of environmental degradation are to be made in support of economic development in the Basin.

2. Environmental improvement projects are to be selected on the basis of their contribution toward achievement of designated quality or use standards and criteria.

3. The investment strategy and fund allocation procedure for project selection shall be consistent with the laws controlling environmental degradation.

B. Implied Criteria. From the basic objectives it follows that their assurance depends on the pursuit of certain criteria in the priority scheme.

- The pollution abatement program shall consider the full range of pollutants to ensure general environmental improvements at selected locations.

- Concentration of resource investment implies selectivity and discrimination in pollution abatement. This leads to the acceptance of the fact that many pollution sources will not qualify immediately for abatement action. The magnitude of the pollution from these sources may be great but the benefits of abatement are small, considering economic as well as environmental benefits.

- Following the principle of comprehensive pollution abatement for economic development enhancement the selection of suitable investments shall be made to assure the benefits accrue where:

  -more rather than fewer people are affected

  -the economy is stronger

  -growth is anticipated

  -urban/industrial and rural/recreation activities exist and are planned for expansion

  -resource investment has been made already, and where

  -public policy has established that public investments shall be made.

- To follow established precedent of public investment programs, effort by public bodies and private organizations shall be recognized. Whether viewed as an incentive or as a reward, the maximization of public resource allocation is more likely to be attained if local and regional effort is an established part of fund allocation considerations. Effort is interpreted to include planning, financing of

improvements, regulations, as well as the implementation of plans and the strict and equitable administration of regulations and ordinances.

- The deliberate adherence to existing laws controlling environmental degradation is another effort to be recognized as a priority determination criterion. In addition, assistance to ensure strict observance of these laws shall be considered as a fundable project alongside other abatement projects within the framework of the priority determination procedure.

CHAPTER TWO: THE ECONOMY OF THE MONONGAHELA RIVER BASIN

Among the major priority determinants are population, the nature of the Basin's economy, and public development policies. The procedure relies heavily on the assessment of these factors.

Fortunately, information on the economy is well documented and available for use. How the data will be used is explained in the next chapter. In this chapter a summary of the Basin's and sub-basins' economy is given together with development policies in sufficient detail for assigning a significance rating of abatement in the sub-basins. Fuller descriptions of the economies of the sub-basins and their growth centers are given in Appendix A.

The Monongahela River Basin has been divided by major tributary basins and the available county data has been reassigned to sub-basins according to distribution of population. The sub-basins, with population data and growth center locations, are shown in Figure 1; their state and county locations are:

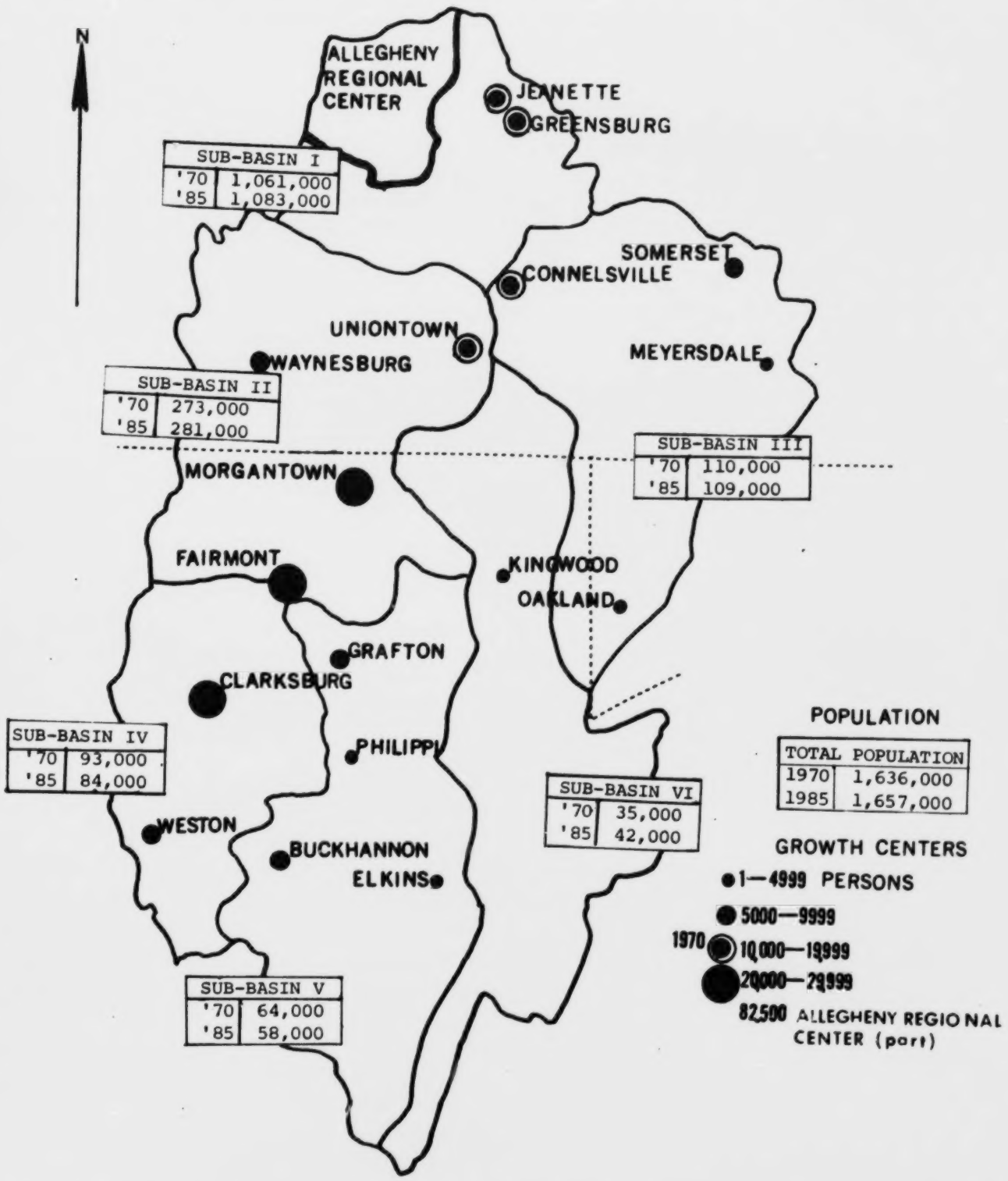
Monongahela Sub-Basins

Sub-Basin	State	County
I Greater Pittsburgh	Penn.	Allegheny, Westmoreland, Washington, Fayette
II Monongahela	Penn. West Va.	Greene, Fayette, Washington Monongalia, Marion, Preston
III Youghiogheny	Maryland Penn. West Va.	Garrett Somerset, Fayette Preston
IV West Fork	West Va.	Harrison, Lewis, Marion, Taylor, Barbour, Upshur
V Tygart	West Va.	Taylor, Barbour, Upshur, Randolph, Preston, Monongalia, Marion
VI Cheat	Penn. West Va.	Fayette Preston, Randolph, Monongalia, Tucker, Pocahontas (minor portion)

Figure 1

MONONGAHELA BASIN POPULATION

MAJOR SUB–BASINS AND GROWTH CENTERS



A. Population. Of the 1,636,000 persons living within the Monongahela Basin in 1970, about 65 percent were located in the Greater Pittsburgh Sub-Basin. Sub-basins have been numbered by their population rank.

Sub-Basin Populations, 1970

Greater Pittsburgh I	Monongahela II	Youghiogheny III
1,061,000	273,000	110,000
West Fork IV	**Tygart V**	**Cheat VI**
93,000	64,000	35,000

The currently available population projections have been used. These projections, provided by ARC, were prepared before the 1970 Census of Population. Furthermore, they appear to be trend projections which do not take account of the Commission's policies and investment strategy as represented by the program of investment and designation of growth centers. The projections seem of questionable reliability, as shown by comparing 1970 estimates with the actual 1970 census count. New projections are being prepared at the present time by the ARC staff using different assumptions.

Actual and Estimated 1970 Sub-Basin Population

	I	II	III	IV	V	VI
Actual 1/	1,061,000	273,000	110,000	93,000	64,000	35,000
Estimated 2/	1,021,000	280,000	118,000	88,000	64,000	42,000
Difference	+40,000	-7,000	-8,000	+5,000	none	-7,000

1/ 1970 Population Census
2/ ARC Projections

Updated projections may provide more reliable estimates of likely population changes. Meantime, we have used the existing projections.

Population Change 1960-1985

Sub-Basin	1960	1970	1975	1980	1985
I	1,062,000	1,021,000	1,025,000	1,031,000	1,083,000
II	283,000	280,000	275,000	274,000	281,000
III	118,000	118,000	115,000	111,000	109,000
IV	100,000	88,000	85,000	83,000	84,000
V	69,000	64,000	62,000	60,000	58,000
VI	38,000	42,000	41,000	41,000	42,000

Source: Based on ARC, Population Projections by Counties.

Viewed over the 1960-1985 period only two sub-basins were estimated to show growth (Greater Pittsburgh and Cheat).

B. Employment. 1970 County Business Patterns was used to determine employment structure of each sub-basin and total employment. The unemployment rate was obtained from the U.S. Department of Labor and the State of Maryland.

Sub-Basin	Total Employment	Unemployment Rate	Industries of Highest Employment
I	335,705	6.3	Trade, Service, Primary Metal
II	55,780	6.7	Trade, Mining, Service
III	17,624	9.1	Trade, Service, Apparel
IV	22,945	4.9	Trade, Glass, Service
V	9,424	7.6	Trade, Mining, Service, Wood Products
VI	5,124	9.7	Trade, Service, Wood Products, Mining

In the Monongahela River Basin 446,602 persons were employed in 1970 in all industries. Primary industries (4 percent of total employment) are dominated by mining which makes up 97 percent of disclosed[1/] primary employment. Coal mining is most important. Agriculture and forestry are of minor importance and are expected to decline.

Secondary industries employ 38 percent of total employment. Primary metal industries employ the greatest numbers of people followed by all types of machinery including electric equipment. Glass products are also important basin-wide.

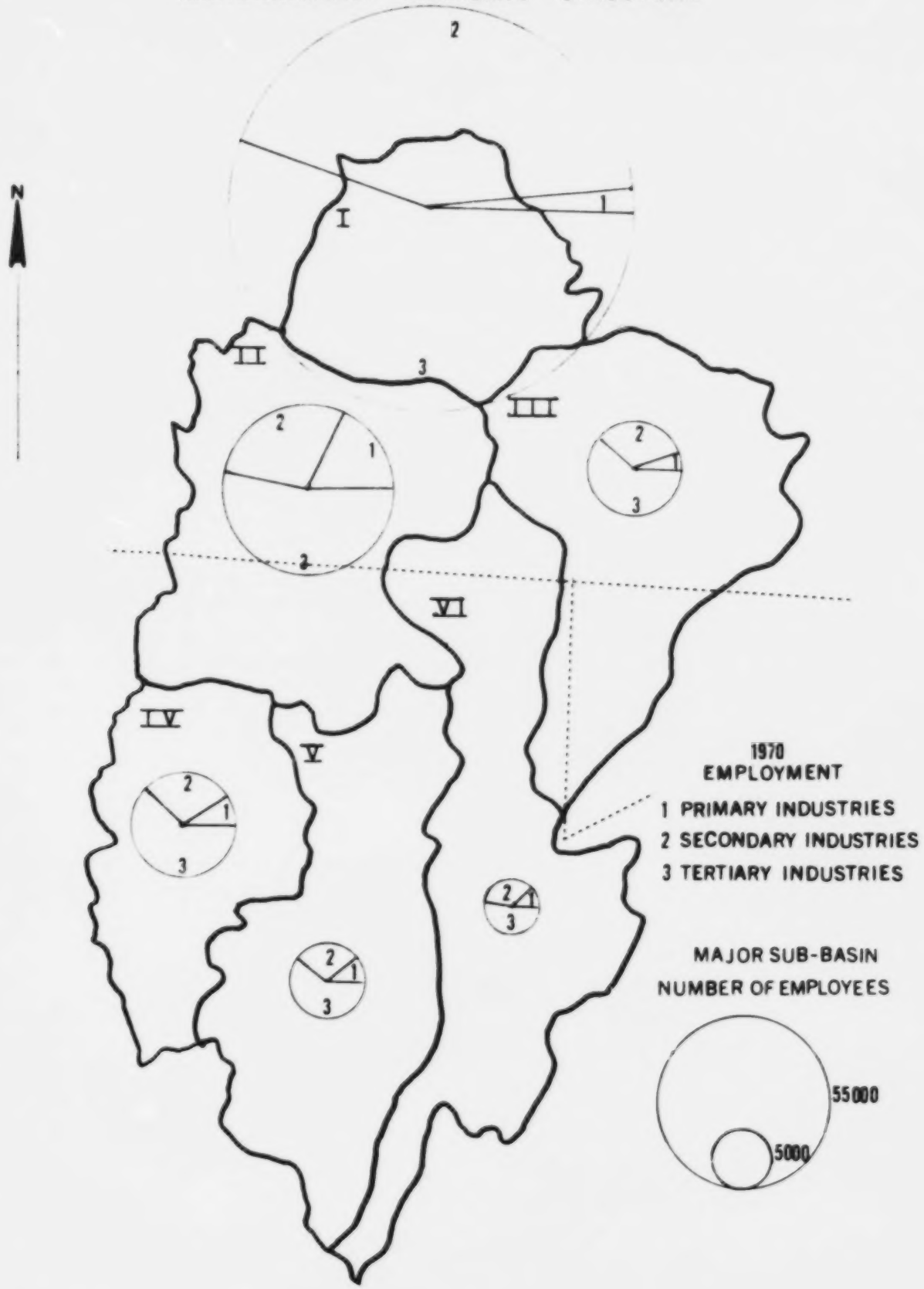
Tertiary industries employ 58 percent of disclosed total employment. Trade is the leading tertiary industry in all sub-basins and services rank second.

The employment distribution by major industry groups is illustrated in Figure 2.

1/ Denotes figures withheld to avoid disclosure of operations of individual reporting units.

Figure 2

MONONGAHELA ECONOMIC STRUCTURE



Sub-Basin Employment by Industry, 1970

Sub-Basin	Industry			Total Employment
	Primary	Secondary	Tertiary	
I	4,462	122,091	158,974	335,705
II	9,165	15,367	28,908	55,780
III	1,045	5,776	10,716	17,624
IV	2,207	6,879	14,118	22,945
V	1,047	2,649	5,656	9,424
VI	543	1,495	2,281	5,124

C. Industrial Growth. Industrial growth prospects may be inferred from the Office of Business Economics earnings estimates for Water Resources Sub-Area 0502, which coincides with the Monongahela River Basin. Industries showing greatest earnings growth during the 1959-1990 period are related to the sub-basins in which those industries are substantially represented.

Expected Industrial Growth in Sub-Basins

I	II	III	IV	V	VI
Trade	Mining	Mining	Glass	Mining	Mining
Service	Trade	Trade	Mining	Wood Prod.	Wood Prod.
Machinery	Service	Apparel	Trade	Trade	Trade
Construction	Glass	Service	Service	Service	Service
Glass	Construction		Construction		

The Office of Business Economics estimates all industries within the Monongahela River Basin, with the exception of agriculture and forestry, will show growth in earnings during the 1959-1990 period. Selected industries are ranked by their estimated growth ratio. Those with highest rankings show greatest potential growth in earnings.

Selected Industry	1959-1990 Growth Ratio
Transportation Equipment	8.48
Paper	6.20
All Machinery	5.74
Construction	5.64
Chemicals	5.29
Service	4.01
Printing and Publishing	3.96
Furniture and Lumber	3.60
Apparel	3.19
Trade	2.86
Fabricated Metals	2.59
Primary Metals	2.12
Stone, Clay, Glass Products	2.07
Food	1.47
Mining	1.44

Source: Office of Business Economics, Water Resources Sub-Area 0502

Growth ratios for earnings of all industries by sub-basin for the 1959-1990 period are:

Sub-Basin	I	II	III	IV	V	VI
Growth Ratio	2.95	2.06	2.64	2.11	2.30	2.40

Industrial earnings growth in the Greater Pittsburgh Sub-Basin will be greatest and earnings growth in the Monongahela Sub-Basin will be least during the 1959-1990 period.

Per Capita Income. Income per capita for the Monongahela River Basin was $3,267 in 1970. Income per capita projections have been made by the ARC for the 1959-1985 period.

Sub-Basin	1959	1970	1975	1980	1985	Growth Rate
I	2,625	3,661	4,293	5,032	5,708	2.18
II	1,882	2,630	3,115	3,725	4,391	2.33
III	1,726	2,442	2,883	3,438	4,047	2.34
IV	1,894	3,053	3,791	4,451	5,289	2.79
V	1,303	2,026	2,474	2,963	3,540	2.72
VI	1,312	1,825	2,187	2,695	3,087	2.35

Source: ARC

Highest income per capita is maintained throughout the period, in Sub-Basin I. Others ranked by continued highest income per capita, are Sub-Basin IV, Sub-Basin II, Sub-Basin III, Sub-Basin V and Sub-Basin VI. Showing greatest potential growth during the 1959-1985 period, relative to 1959 income levels are Sub-Basin IV and V, Sub-Basins IV, III and II income per capita will grow at about the same rate. Sub-Basin I will show the smallest rate of change.

D. Recreation. In contrast with the manufacturing region in the western portion of the Monongahela River Basin, are the more rural, less densly populated, eastern sub-basins. Of these, the Youghiogheny Sub-Basin and the Cheat Sub-Basin have been developed for outdoor recreation. Greatest development has taken place in the Youghiogheny Sub-Basin, where publicly financed recreation areas have been supplemented by private investments. The emphasis in this area is on growth and expansion of both winter and summer recreation facilities and the promotion of associated activities such as second home sites. A current study by the Bureau of Outdoor Recreation may designate stretches of the Youghiogheny River as a wild and/or scenic river.

A large percentage of the Cheat Sub-Basin is contained in the Monongahela National Forest. Most recreation facilities within this basin are publicly owned. Emphasis in this region has been on preservation of natural recreation areas rather than development and promotion of associated activities. However, three skiing areas are currently being planned.

The 1970 and projected visitor days to the facilities in the two sub-basins indicate the importance of environmental protection in these areas. As the diagram on Figure 3 shows, a high proportion of the visitor days is for water related recreation activities.

Recreation Visitor Activity Days (in '000)

Sub-Basin	1970	1985
Youghiogheny	12,269	17,945
Cheat	5,819	8,179

Source: ARC

Figure 3 and the following list show existing and planned recreation areas in the Basin.

Monongahela Basin Recreation Areas

Map #	Area
1	Laurel Summit State Park
2	Linn Run State Park
3	Kooser State Park
4	Laurel Hill State Park
5	White Mountain Ski Area
6	Kings Mountain Resort
7	Plateau DeMont
8	Hidden Valley
9	Seven Springs
*10	Yellow Creek State Park
*11	Ohiopyle State Park
12	Glade Knob
13	Patomic Heritage Trail
*14	Callimont
15	Youghiogheny Reservoir Marina Development

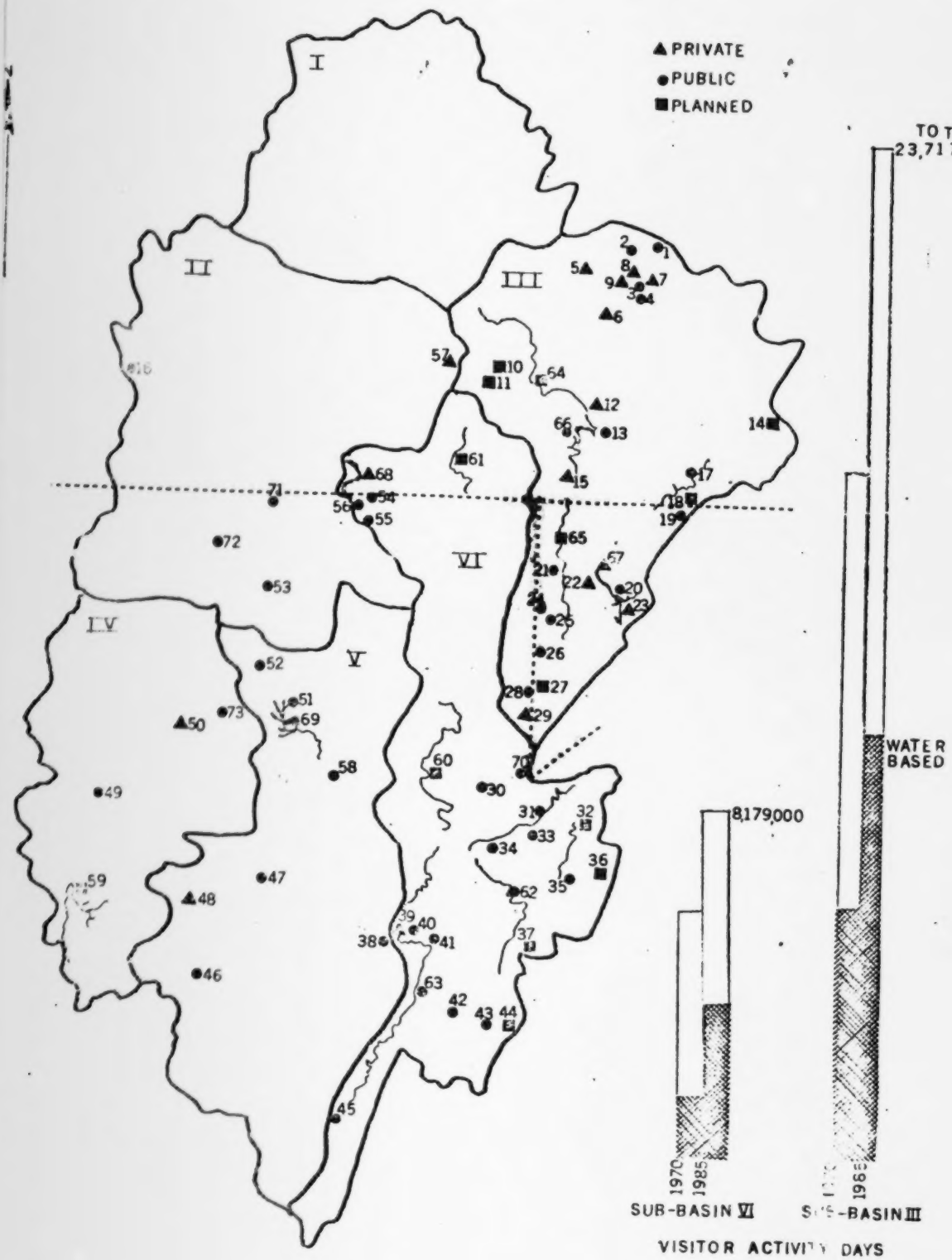
Map #	Area
16	Ryerson Station State Park
17	Casselman Bridge State Park
*18	Upper Casselman Reservoir Resort
19	New Germany State Park
20	Deep Creek Lake State Park
21	Wild River State Park
22	Wisp Ski Area
23	Deep Creek Private Development
24	Cranesville Swamp
25	Swallow Falls State Park
26	Herrington Manor State Park
*27	Upper Youghioheny Reservoir Developments
28	Cathedral State Park
29	Silver Lake
30	Horseshoe National Forest Recreation Area
31	Blackwater River - state designated wild river
*32	Federal Power Commission Impoundment
33	Blackwater State Park
34	Olston Tower
35	Canaan Valley State Park
*36	Cabin Mountain Ski Area
*37	Job Knob Ski Area
38	Stuart National Forest Recreation Area
39	Bickle Knob
40	Bear Heaven National Forest Recreation Area
41	Albena Gap
42	Laurel Fork National Forest Recreation
43	Sinks of Gandy
*44	Spruce Knob Lake
45	Kumbrabow State Park
46	French Creek Game Farm
47	Audra State Park
48	Zickelfoose Recreation Area

Map #	Area
49	Watters Smith State Park
50	Glass Barn Recreation Area
51	Tygart Lake State Park
52	Valley Falls Recreation Area
53	Pricketts Fort State Park
54	Chestnut Ridge
55	Coopers Rock State Park
56	Mont Chateau State Park
57	Mount Summit Resort
58	Teter Creek Lake Wildlife Area
*59	Authorized Corps of Engineer Stonewall Jackson Lake
*60	Authorized Corps Rowelsburg Lake
*61	Proposed Big Sandy Creek Reservoir
62	Dry Fork - state designated wild river
63	Shavers Fork - state designated wild river
*64	Wild River
*65	Scenic River
66	Youghiogheny Reservoir
67	Deep Creek Lake
*68	Lake Lynn
69	Tygart Lake
70	Thomas Park Fishing Lake
71	Westover Park Fishing Lake
72	Dents Run Fishing Lake
73	Doe Run Sub Impoundment

* Designates proposed recreation area.

Figure 3

MONONGAHELA RECREATION AREAS



E. Accessibility. Transportation to and within the Monongahela River Basin has been generally poor. The best transportation service has been in the north, in the Pittsburgh area. Interstate highways, air transportation, rail facilities and river freight traffic makes the Greater Pittsburgh Sub-Basin the most accessible in the region. Accessibility for other sub-basins will be improved by the development highways now under construction or planned for the near future. Interstate 79 will provide north-south high speed transportation to the manufacturing cities in the west. Appalachian Corridors D, E, H, N and M will provide good highway transportation within the Basin and access to outside markets, as shown on Figure 4.

Major Highways in Sub-Basins

Sub-Basin	Federal Highways Interstate Route	Appalachian Highway Corridor
I	70, 76, 79	M
II	79	E
III	70	N, E
IV	79	D, H
V		H
VI		H, E

One gateway airport serves the Pittsburgh area. Three local service commercial airports are dispersed within the Basin at Morgantown, Clarksburg and Elkins. Small air carrier service airports, both publicly and privately owned, are located throughout the Basin.

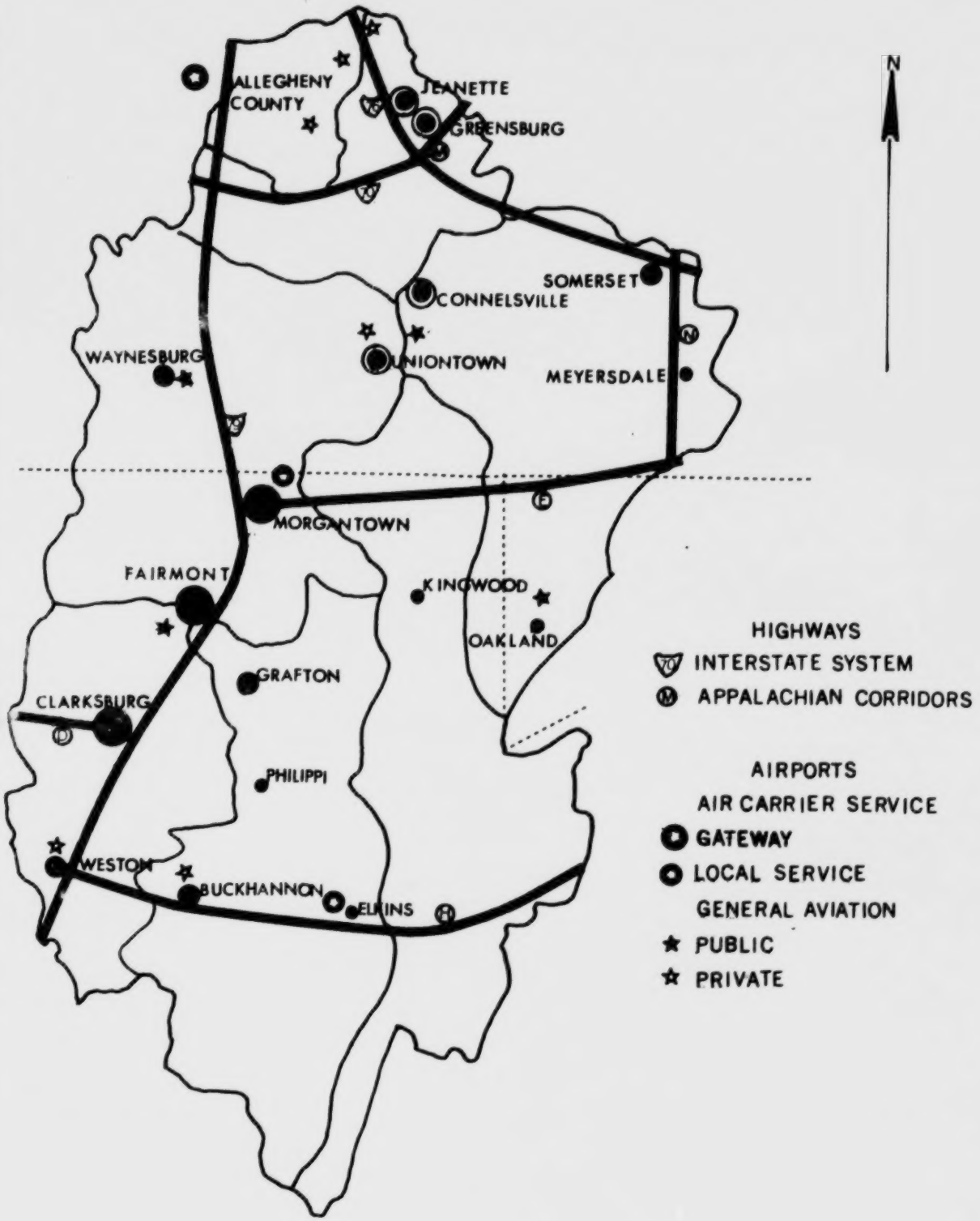
Air carrier service at the local service airports will be improved to "gateway" status by 1981. Only one of the substandard public and private general aviation airports plans improvements to become standard by 1981. This airport is at Oakland in Garrett County, Maryland.

Airports in Sub-Basins

Sub-Basin	Airports		
	Gateway	Local Service	General
I	1		3
II		1	3
III			2
IV		1	1
V		1	1
VI			

Figure 4

MONONGAHELA BASIN ACCESSIBILITY



The Monongahela River is navigable from Fairmont to Pittsburgh. Annually, 27 million tons of coal, sand and gravel, iron and steel products, and petroleum products are transported on the Monongahela River. Five ICC regulated barge lines and one contract carrier provide water transport service.

Twenty-two railroads and four major lines serve the Pittsburgh and Monongahela River areas. The large network of railway trackage throughout the entire Basin is being studied for more efficient use.

F. Growth Centers. Selected urban centers within the Monongahela River Basin have been designated by the states as growth centers. (See Figure 1.) A new town in Fayette County is under consideration by the Department of Housing and Urban Development. In order that this investment be protected and the town's function as a model for growth be realized, the town should be added to currently designated centers when final plans are approved.

There were some 267,600 persons residing in the growth centers in 1970. Sub-Basin I had the greatest growth center population. All of Allegheny County is designated as a regional growth center. The portion of Allegheny County population located within Sub-Basin I plus populations of Jeanette and Greensburg, make up 42 percent of the total growth center population of the Basin.

Growth Center Population, 1970

	I	II	III	IV	V	VI	TOTAL
Total Growth Center Population	113,587	76,958	22,346	32,187	19,983	2,550	267,611
Growth Centers Population	Allegheny 82,508	Morgantown 29,431	Connelsville 11,643	Clarksburg 24,864	Buckhannon 7,261	Kingwood 2,550	
	Greensburg 15,870	Fairmont 26,093	Somerset 6,269	Weston 7,323	Grafton 6,433		
	Jeanette 15,209	Uniontown 16,282	Myersdale 2,648		Elkins 3,287		
		Waynesburg 5,152	Oakland 1,786		Philippi 3,002		

Source: 1970 Census

Growth centers which have shown growth over the 1960-1970 decade are Morgantown in Sub-Basin II, Buckhannon, Grafton and Philippi in Sub-Basin V, and Kingwood in Sub-Basin VI. All others declined in population during the 1960-1970 decade.

The Appalachian Regional Commission has estimated growth of these centers combined with their primary trade areas based on 1960 census figures. Those centers with trade areas expected to show growth during the 1960-1985 period are Oakland, Morgantown, Kingwood, Jeanette-Greensburg, Fairmont, Clarksburg, Myersdale, and Buckhannon. These projections appear to be based on past trends. As designated growth centers, these towns are the preferred location for economic investments and if investments are concentrated in them they may show an improved economic outlook. Population change in these centers should reflect the improved economic conditions. The rate of decline estimated by ARC for other centers may not take place if planned investments are successful in improving the economic climate of the Monongahela River Basin.

Growth Centers with Primary Trade Area Population, 1960-1985

	1960	1970	1975	1980	1985	Growth Ratio*
Sub-Basin I						
Allegheny Center	812,550	772,200	770,900	775,450	803,350	.98
Jeanette-Greensburg	352,600	368,600	374,500	392,000	419,800	1.19
Sub-Basin II						
Uniontown	140,600	135,700	127,700	122,400	119,800	.85
Fairmont	63,700	68,600	69,600	70,300	73,200	1.14
Morgantown	51,300	56,900	59,700	62,700	65,900	1.28
Waynesburg	15,600	12,500	12,300	11,900	12,300	.78
Sub-Basin III						
Connelsville	96,700	93,300	87,800	84,200	82,400	.85
Somerset	27,900	29,400	28,900	28,000	27,500	.98
Myersdale	10,300	11,100	11,100	10,900	10,700	1.03
Oakland	9,400	11,100	11,500	11,800	12,200	1.29
Sub-Basin IV						
Clarksburg	77,900	66,400	62,500	61,300	60,600	1.04
Weston	19,700	19,700	19,700	19,700	20,500	.84
Sub-Basin V						
Elkins	17,300	16,700	16,500	16,400	16,500	.95
Buckhannon	15,900	16,700	16,600	16,300	16,200	1.01
Grafton	15,000	14,200	13,200	12,300	11,400	.76
Philippi	10,100	8,000	9,800	7,700	7,600	.75
Sub-Basin VI						
Kingwood	15,600	17,500	17,800	18,200	18,900	1.21

Source: ARC

*Growth ratio less than 1 indicates decline.

CHAPTER THREE: THE PRIORITY DETERMINATION PROCEDURE

I. Overview and Framework of the Procedure

The procedure follows logically from objectives to project selection, considering along the way the relevant economic, pollution, institutional, and community effort factors. Though the process is logical, it is also complex since it relates many and varied elements. An explanation in two parts may, therefore, be helpful. First, in this section, we present the general framework of the procedure in a simplified form devoid of detail to show: what the priority components are, what areas are used for analysis and ranking and fund allocation, and what factors are considered and how they are considered at each stage in the process. Then, in the second section, we go over the procedure in detail to discuss how the information is used, how various priority factors may be rated, and how project selection can be accomplished.

A. The Priority Components Associated with the Objectives. First, we recapitulate the components relating to the abatement objectives:

-Assessment of the Basin's economy, population distribution, and growth prospects,

-Public development policies regarding future growth,

-Public resource investments,

-Public environmental controls,

-Public improvement efforts and plans,

-Information about various types of pollutants, location and magnitude,

-Extent of areas affected by pollutants,

-Information about 'controllable' pollution under existing laws and regulations.

B. Areas Used for Analysis, Ranking, and Fund Allocation

1. Pollution Abatement Zones

The primary unit selected for analysis of priority factors and for allocating pollution abatement funds is the Pollution Abatement Zone. As explained before, pollution occurs all over the Basin yet it varies in intensity; sources are concentrated in some locations and scattered

elsewhere. In order to comprehend the dimensions of the pollution problem it becomes necessary to organize the pollution information geographically. Equally, for project investment purposes, the priorities cannot be handled basin-wide for each and every pollution source. There are, for example, over 3,000 draining coal mine sites with discharges of varying seriousness, draining into different streams, and having diverse effects; these cannot be evaluated basin-wide, quite apart from the fact that the streams they drain into are also affected by pollution from domestic sewage, industrial waste, and other contaminants.

We have found that even major sub-divisions of the Basin would still be too large because of two primary objectives - of dealing with pollution comprehensively, i.e. achieving locally all-round environmental improvement instead of cleaning up individual pollutants, and secondly, of concentrating investment for maximum development benefit. We concluded, therefore, that the most useful grouping would be by well defined areas - pollution abatement zones. These are the primary units for assessing types of existing pollution and magnitude of pollution, as well as understanding local pollution relationships and pollution effects in specific areas to which funds can be allocated for abatement investment.

It is the pollution abatement zones, which combine the whole mixture of water, air, and land degradation found in a tightly circumscribed area, that will be taken through the measuring, ranking, effect and effort assessment procedure to the stage of fund allocation. Available funds will be assigned to these zones according to their relative priority rating. Once a given amount of money has been reserved for a pollution abatement zone, internal zone priorities are used to spend the money on abatement projects in that zone to maximize benefits.

2. Sub-Basins

For the analysis of economic and population characteristics the Monongahela River Basin has been divided into six sub-basins consisting of the drainage areas of the major tributaries in the Basin, except for that part of the Lower Monongahela and the Lower Youghiogheny drainage areas covered by the Pittsburgh metropolitan area (SMSA) which has been defined separately. The six sub-basins are:

I	Greater Pittsburgh
II	Monongahela
III	Youghiogheny
IV	West Fork
V	Tygart
VI	Cheat

These six areas serve as economic analysis units which constitute naturally defined areas of common characteristics; they also allow, as far as water pollution is concerned, the effects of pollution abatement to be assessed . major drainage basins.

3. Counties

The counties in the Basin were selected as the best and most logical administrative areas for which measures of environmental improvement effort could be established.

C. Major Steps in the Procedure. Keeping the end product in view, there are some four steps to go through before projects can be selected. The steps are not performed in isolation from each other, but in explaining the procedure it helps to think of them as identifiable stages in the priority selection process. In the procedure diagram (p. 32) they are the various activities shown under Steps 1 to 5 and they are concerned with information gathering, the rating of the priority factors, the rating of abatement zones and weighting of the relative importance of illegal pollution in the Basin, the identification of projects and the determination of funding policy.

The first step of the inventory of information comprises the foundation of the procedure and covers the three main priority factors of (1) pollution, at source and impact area, (2) the Basin's economy, and (3) all the attempts at community improvement grouped together under "effort." The pollution data has to be listed in greatest detail and for the most part "at source" for later use in stage two and in the project selection stage.

The second step involves the measuring and the assignment of values to the same three groups of factors. This is done by the various areas previously discussed - (1) pollution is measured within abatement zones and impact areas to provide a Basin-wide ranking of the seriousness of pollution in each zone and impact areas, (2) the importance of abating the pollution is rated by the significance of the benefits to the economy and the number of beneficiaries; this rating is done at two geographic levels (by sub-basin and by local impact area), and (3) the effort is rated by county.

It is convenient to use a 100 scale for scoring the effort and a 200 scale for significance factors, but for measuring pollution it is best to leave an open ended score. The later composite rating weights the relative importance of the three criteria. The major scores used (which are explained in detail in the next section) are:

Magnitude of pollution	open ended
Significance of abatement:	
a. Basin-wide	80
b. Local	120
	200
Effort	100

The third step consists of two parts - the composite rating of pollution abatement zones and the assessment of the relative importance of illegal pollution. The composite rating merges the three individually ranked sets of priority criteria - pollution, significance, and effort - for each pollution abatement zone. To arrive at a zone ranking three essentially disparate elements are combined. The scores of the priority factors are not simply added but their rank orders are combined.

At present our knowledge about illegal pollution is confined to mine drainage. When comparable information is available for other forms of pollution the total "controllable" amount of pollution in the Basin can be reviewed.

The fourth step combines project identification and funding policy determination. The previous steps provided the data and a rationale for assessing pollution and its effects on the Basin. In the fourth step the procedure moves to the consideration of priority abatement projects and funding policy.

The final step, for which the whole procedure is designed, will select the abatement projects, in the funded zones and for law enforcement, Basin-wide. The detailed pollution information gathered in the first step is of vital importance to the project selection. At this stage both early and subsequent action projects can be selected in relation to cost considerations.

Since the procedure is to be used annually, it means that there will be a continual process of project selection, project investment and execution, and resulting environmental improvement leading to the selection of the next, lower priority projects. Consequently, the determination mechanism needs periodic updating. The expected success of the investment in abatement projects changes the Basin-wide pollution situation, and these changes must be recorded. Equally, over time the circumstances of the economy and population will change, as will

the local and state efforts toward environmental protection. All these factors must be updated.

Aside from keeping the system current there is also need for assessment of another kind. The effects of abatement projects should be evaluated in terms of technical accomplishments and of benefits to communities and their economy. This evaluation procedure should, therefore, be built into the system at the outset and become part of the updating step.

The steps and the flow of the procedure are schematically illustrated on the following page.

II. Detailed Description of the Procedure

A. Inventory of Pollution Information

1. Data to be Collected

The inventory is to be prepared for each county and municipality that is wholly or partially within the Monongahela River Basin boundaries. It is directed toward establishing (1) a comprehensive list of pollution sources, (2) identification of the pollutants generated by the individual sources and (3) the measure of pollutants generated.

Pollutants of water, land and air are to be covered by the inventory. The list may be modified to accommodate findings of the actual survey and subsequently, as elements enter or leave the scene. For each pollutant the following data are to be collected:

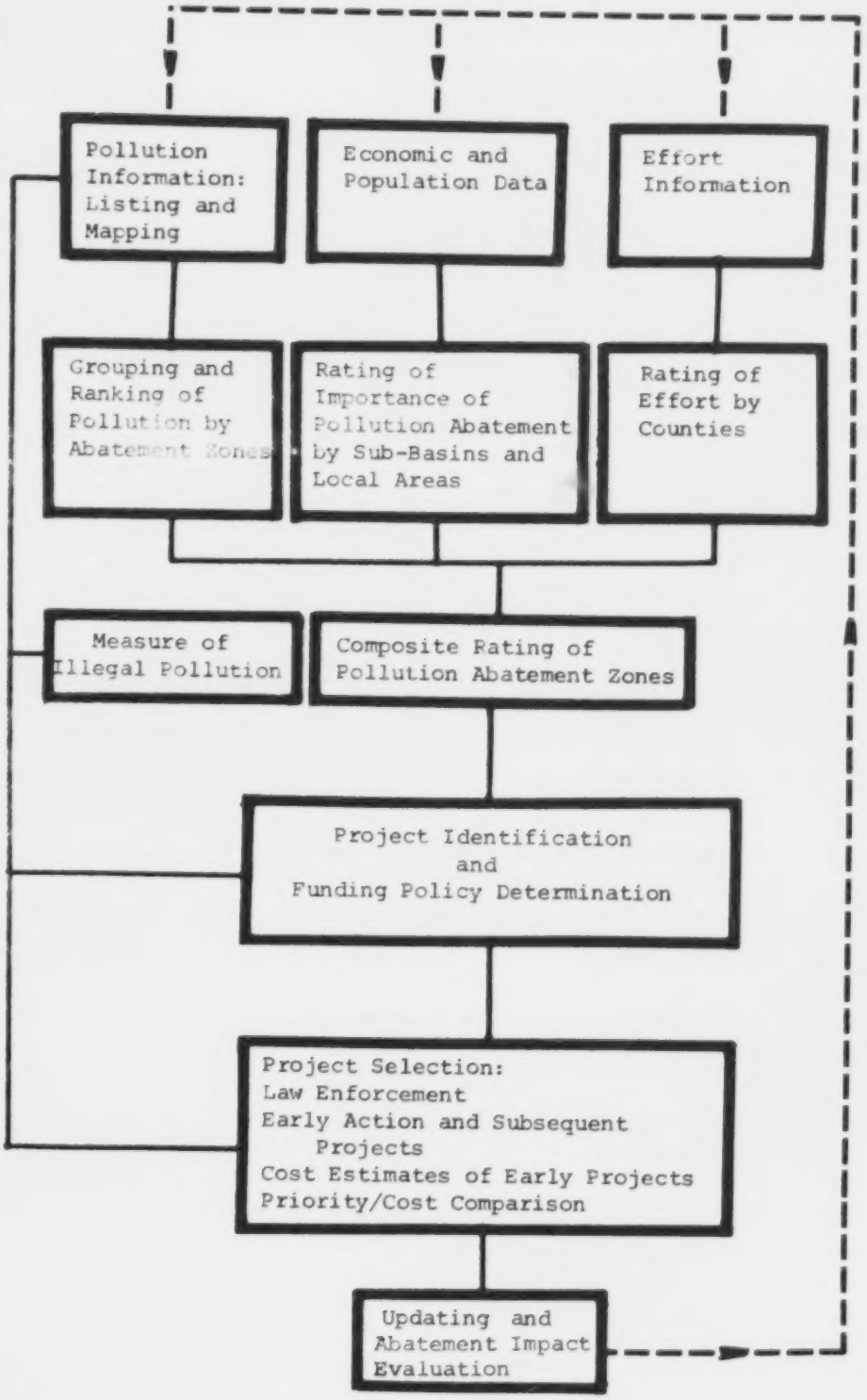
1. Identification and locations of the sources.

2. Volume, area or other relevant measure of the amount of pollutant generated by each source.

3. Identification of the area affected by the pollutant (e.g. name of the receiving stream, extent of the airshed, stretch of the highway or stream from which the blight is visible, neighborhood, municipality or sub-basin).

4. Standards or conditions of the permit under which the emission or other blighting conditions are occurring if any. Designation of whether "legal" or "illegal."

PROCEDURE DIAGRAM


Pollution Information: Listing and Mapping
Economic and Population Data
Effort Information
Grouping and Ranking of Pollution by Abatement Zones
Rating of Importance of Pollution Abatement by Sub-Basins and Local Areas
Rating of Effort by Counties
Measure of Illegal Pollution
Composite Rating of Pollution Abatement Zones
Project Identification and Funding Policy Determination
Project Selection:
Law Enforcement
Early Action and Subsequent Projects
Cost Estimates of Early Projects
Priority/Cost Comparison
Updating and Abatement Impact Evaluation

Step 1
Inventory of Information

Step 2
Rating of Priority Factors

Step 3
Composite Rating

Step 4
Project Identification
Funding Policy

Step 5
Project Selection

2. List of Pollutants

A. WATER POLLUTANTS

1. Mine Drainage[1/]
   a. Acid
   b. Iron
   c. Sulfates
   d. Other

2. Municipal Waste
   a. Sewered
   -Toxic Substances
   -Pathogens
   -Oxygen demanding wastes
   -Bio-stimulants
   -Radioactive Substances
   -Suspended Materials
   -Heat
   -Surface Materials
   -Total Dissolved Solids

   b. Unsewered
   General construction sedimentation components
   Other urban run-off components

3. Industrial Waste
   a. Acid
   b. Iron
   c. Dissolved Solids
   d. Alkalinity
   e. Manganese
   f. Sulfate
   g. Temperature Increase
   h. Odor
   i. MBAS (Methylene Blue Active Substances)
   f. Cyanide
   g. Fluoride
   h. Chloride
   i. Phosphate
   j. Phenols
   k. Color
   l. Copper
   m. Zinc
   n. Other

1/ This portion of the inventory may be considered complete. The data compiled by the Monongahela River Basin Enforcement Conference are available on tapes.

4. Farm Run-Off
   a. Herbicides - Components and Estimated or Measured Amounts
   b. Pesticides - Components and Estimated or Measured Amounts
   c. Fertilizers - Components and Estimated or Measured Amounts
   d. Animal Waste - Components and Estimated or Measured Amounts
   e. Erosion and Sedimentation - Components and Estimated or Measured Amounts.

B. LAND POLLUTANTS

1. Mine Subsidence and Other

2. Unreclaimed Strip-mined Areas

3. Solid Waste
   a. Domestic:
      general litter
      open dumps - publicly operated
      open dumps - private
   b. Industrial:
      gob piles
      other
   c. Junk Cars:
      salvage yards
      abandoned heaps

4. Mine and Coal Seam Fires

C. AIR POLLUTANTS

1. Power Plants - Components

2. Industrial Components

3. Residential

4. Construction

5. Mining - related
   a. Spoil and refuse piles
   b. burning waste banks

6. Vehicular Exhausts

3. Tabulation of Data

Data from the inventory are to be tabulated by:

1. State and County and

2. Stream segment, land area or airshed affected by the pollution.

"Legal" and "illegal" pollution are to be distinguished in each case.

4. Data Mapping

The locations of the sources are to be mapped at such scale and in such a manner that:

1. A composite of county inventory maps drawn to a consistent scale will provide an overall basin-wide picture of the spectrum of environmental blight conditions. The maps should indicate the relationships of the blight conditions to tributary basin boundaries; to urban areas, particularly designated growth centers; to major highways; and to existing and proposed recreation areas.

2. Overlays for the different types of pollutants will, in juxtaposition, show up the areas where multiple problems exist. This will be the basis for delineating the pollution abatement zones, or those locations where abatement efforts are to be directed.

3. Stream segments and testing station locations can be superimposed to aid in tabulating pollution source data in a way that will correlate with stream quality data and other test results. This will facilitate operation of stream quality simulation models to test the impact of alternative projects. It will also serve as basis for evaluating enforcement and other pollution abatement efforts over time, including the effectiveness of the testing device system itself.

The other information needed for the priority procedure - about the economy of the Basin and environmental protection efforts - does not require such elaborate listing. The economic and population factors needed for the procedure have been assembled (Chapter Two and Appendix A). The data needs for the effort index are specified under D below.

5. Delin ation of Pollution Abatement Zones

The pollution abatement zones are of central importance to the procedure, and since we cannot at this stage, due to incompleteness of the information, define the zones in the Basin, the following guidelines and criteria are provided to allow uniform zone definitions. The criteria to be observed are:

a. Drainage Orientation - Drainage shall provide the link for the grouping of pollution sources. Groups and scattered pollution sources shall be combined so that they fall within one or more minor sub-basin. The zones shall not overlap the boundaries of one of the six major sub-basins. The reason for drainage orientation is that pollution sources and the areas affected by the pollution are kept together. This shows the bias toward water pollution in the procedure, which is warranted in the case of the Monongahela River Basin.

b. Stream Zone and Stream Sample Station Orientation - Designated water uses and water quality criteria have been established by the states for stream sections or stream zones. These designations will be used in the priority procedure as a measure of abatement objectives - the deviation of the existing water quality from the adopted standard will indicate abatement need. The states also have permanent stream sample stations throughout the Basin. The pollution abatement zones shall, therefore, be drawn to conform, where possible, to the stream quality zones and shall have, where possible, a stream sample station at the downstream end of the zone.

c. Urban Development Relationship - Zones shall be defined to link, where appropriate, pollution sources to urban areas immediately affected by them.

d. Recreation Area Relationship - Zones in the major 'recreation' sub-basins shall link, where appropriate, pollution sources to pollution affected recreation areas, both existing and planned.

e. Spatial Separation Between Zones - Zones shall be tightly delineated to establish separately identified areas for pollution abatement project selection.

f. Disregard for Total Inclusion of all Pollution Sources - It is not necessary to include all pollution sources into defined zones. Isolated sources of low significance, i.e. small amount and local effect, can be excluded. However, isolated pollution sources of major significance, i.e. of basin-wide impact, shall be linked to the nearest zone in the same drainage area. The reason for this criterion is simply to concentrate on the main job and not be diverted by a great amount of detailed yet unimportant listing and rating of very minor blemishes such as a small hidden dump or a low volume intermittent mine drainage. 1/

Mapping of Pollutants for Zone Definition - The pollution abatement zones can best be established by reference to the mapped information, previously described, including the following locations:

-Discharge points of draining mines
-Discharge points of industrial waste
-Sewage discharge, raw and insufficiently treated
-Solid waste dumps
-Air pollution sources
-Stream sample stations

Preferably, the mapping should be done with reference numbers for each pollutant source keyed to lists of types of pollutants, giving detailed information about the nature and magnitude of the pollution.

B. Procedure for Scoring Pollution Abatement Zones on Measure of Pollutants Generated

Each pollution abatement zone that has been identified, delineated and mapped on the basis of the comprehensive river basin environmental inventory will be given a score reflecting the amounts of pollution it generates relative to the amount generated by each of the others and all of the zones combined. The score will be based on:

1/ An example will explain this point:

In sub-basin 10 (Elk Creek) mines 7-082 and 7-086 are double seam strip mines located on either side of Coplin Run, a small tributary to Brushy Fork. Both are wet, the acid from 7-082 was 1,158 pounds per day. The load from 7-086 was relatively small (30 pounds per day). In the absence of other pollutants, mine area 7-086 can be excluded from the zone; mine 7-082 would be linked to the zone in the Elk Creek watershed. (Source: Summary Report, Monongahela River Mine Drainage Remedial Project, Enforcement Conference Monongahela River and Its Tributaries, 1971.)

1. Amounts of each pollutant generated and

2. Weights assigned to each category of pollutant.

1. Amounts of Pollutants Generated

For each major pollutant, by subcategories legal, illegal, and combined legal and illegal loading, the designated pollution abatement zones are to be arrayed in the order of largest contributor to smallest. See Appendix D for laws and regulations controlling environmental degradation. The zone designation would be in one column and the measure of loading beside it. A third column would give the cumulative load total or the cumulative percentage of load total for all abatement zones. For example:

Water Pollutant 1a (Acid)

Legal			Illegal			Combined Legal and Illegal		
Zone	lbs. Loading	Cumulative % of Loading for All Zones 01 -- n	Zone	lbs. Loading	Cumulative % of Loading for All Zones 01 -- n	Zone	lbs. Loading	Cumulative % of Loading for All Zones 01 -- n
n ↓	Largest Load	25%	n ↓	Largest Load	25%	n ↓	Largest Load	25%
		50%			50%			50%
		75%			75%			75%
01	Smallest Load	100	01	Smallest Load	100	01	Smallest Load	100
All Zones	Total Load	100	All Zones	Total Load	100	All Zones	Total Load	100

The cumulative column is then marked off in increments of 25 percent. Those zones which contribute the heaviest loads, making up 25 percent of the total on the combined legal and illegal rating are given a score of 4.

The zones which contribute the next 25 percent of the load are scored 3. The next group of zones, with smaller loads that make up between 50 and 75 percent of the total are given a score of 2 and the smallest contributors that comprise the last 25 percent of the cumulative total get a score of 1.

Until the full complement of inventory data is available and experience with use of the procedure permits more sophisticated gradations of degree of pollution measurement, some of the pollutants will be more crudely estimated than others. Indeed, some of the pollutants, for example, those in the land and air categories may not lend themselves to the refinements of measurement possible for water pollutants. It should be possible to establish some parallel assessment and relative weighting among and between the different pollutants even in the early use of the procedure. Therefore this simple base of integral scores is recommended. Measurements for those pollutants subject to a wider spread of gradations can be easily translated to this form while measurements subject to more crude general or relative assessment need not be shaved more finely than their actual degree of significance. Fractional points could be applied but would add little or nothing to the operation of the procedure.

If all the environmental pollutants are equally serious, the individual pollutant scores for each zone could be simply added. The resulting sum would be an overall rating for that zone.

2. Weighting of Pollutant Scores

Some pollutants represent more serious problems than others, however. Therefore some differential weighting should be made among them before the zone scores are totalled. The procedure would be accomplished in two stages, the first applying criteria of relative importance within the impacted area and the second, the extent of the impacted area.

For each zone the individual pollutant scores will be listed. Points will be added as follows:

1. Degree of deviation from relevant environmental standards, if any, in the impacted area - 0 to 4 points. Within each pollution abatement zone deviation from environmental standards will be arrayed and array divided into 5 equal groups.

2. Frequency of occurrence - 0 to 3 points.

3. Relative seriousness in terms of overall environmental problems in the impacted area. (This is a judgment on how serious an impediment the pollutant is to the full realization of the area's best prospects for economic growth and quality of life.) - 0 to 4 points.

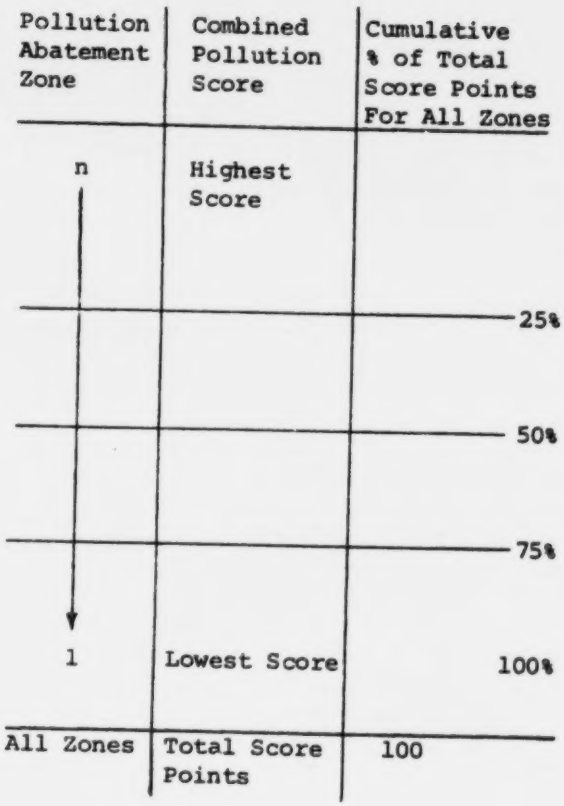
4. Proportion of the total load that is "legal" pollution - 0 to 4 points. ("Legal"pollution alone may exceed the functional standards. The implications for remedy in this case should be distinguished early.)

The adjusted totals are then multiplied by a factor describing the geographic spread of the pollutant's impact, as follows:

1) Local
2) Sub-Basin
3) Whole River Basin

Water pollutants, for example, would have a factor of (3) if their effect on areas downstream is cumulative. Land pollutants would have a multiplier of (1) or (2) if they are visible from a highway or major stream and air pollutants, a (1) or, if they impact major residential or tourist recreation areas, a (2).

The adjusted and weighted scores would then be totalled for each zone to give a combined pollution score. The pollution abatement zones would be arrayed from highest combined pollution score (or greatest magnitude of pollution) to lowest. Cumulative percentage of score points for the zones would be computed and placed in a column next to the score data for the respective zones.



Quartile levels would be marked off on the column showing cumulative percentage of total score points for the array of zones. The zones in the top quartile would get a score of 4. Those in the second quartile would have 3, and so on.

The procedure for deriving the combined pollution scores of the zones is different from the following significance and effort score ratings in that it builds from a unit base, and is open-ended. The significance and effort scores are based on a fixed number of points which are allocated among different factors that enter the evaluation. To allocate a fixed number of points among and between different pollutants at this time might be misleading in giving the impression prematurely that their relative seriousness in the Monongahela River Basin is well understood.

C. Importance of Pollution Abatement Rating

The significance of pollution abatement to economic development in the Basin is assessed at two levels - sub-basin and local. The reasons for the double rating are (1) to give major emphasis in the priority procedure to population, economy, and recreation factors, and (2) to allow pollution impact to be considered both locally and over a wide area.

The value scale adopted is a maximum of 80 for sub-basin significance and a maximum of 120 for local impact.

1. Sub-Basin Significance: Maximum Value 80

The six sub-basins have been rated on the basis of six factors:

1. Size of sub-basin population
2. Projected population change of sub-basin
3. Number of designated growth centers in sub-basin
4. Present population in growth centers of sub-basin
5. Number of major highways in sub-basin
6. Recreation areas in sub-basin

Sub-Basin	Population Size (max.15)	Growth (15)	Growth Centers No. (10)	Pop. (10)	Major Highways (10)	Recre-ation (20)	Total (80)
Greater Pittsburgh	15	10	10 1/	10	10	-	55
Monongahela	10	5	10	5	5	5	40
Youghiogheny	10	-	10	5	10	20	55
West Fork	10	-	5	5	10	-	30
Tygart	5	-	10	5	-	5	25
Cheat	5	5	-	-	5	15	30

1/ Greater Pittsburgh Sub-Basin includes 2 growth centers and the Allegheny Regional Center.

The assigned range of values for each factor are:

Population Size

Over 1,000,000	15
90,000-1,000,000	10
Under 90,000	5

Population Growth
(As currently projected, will need amendment when new projections are available)

(1970-85)	Over 10%	15
	5%-10%	10
	Stable	5
	Decline	0

Number of Growth Centers	
4 Centers	10
2 & 3 Centers	5
1 or None	0

Total Population of Growth Centers	
Over 100,000	10
10,000-100,000	5
Under 10,000	0

Major Highways
(Interstate or Appalachian Corridor Highway)

3	10
2	5
1 or None	0

Major Recreation Areas
(See list of existing and proposed areas in Chapter Two)

Over 30 Areas	20
20-30	15
10-20	10
5-10	5
Less than 5	0

Within each sub-basin every pollution abatement zone will receive the same score for "sub-basin" significance.

2. Local Significance: Maximum Value 120

After pollution abatement zones have received their 'sub-basin significance' score additional values will be assigned to them for local significance. They will be scored according to their location in relation to growth centers, recreation areas, and major highway accessibility.

Growth Center Orientation (Maximum Value 45)

The ARC has defined trade areas for each of the growth centers in the Basin, for which they have also estimated future populations. The population size and projected growth rates have been used for scoring the importance of pollution abatement in zones which (1) include a growth center, or (2) cover a portion of the respective trade area. (See Table in Chapter Two for growth centers with primary trade area population.)

	Growth Center Inside Abatement Zone	Abatement Zone In Trade Area Only
Population of Growth Center Trade Areas		
Over 100,000	30	15
50,000-100,000	20	10
15,000-50,000	10	5
Under 15,000	5	2
Growth Ratios 1960-85		
Over 1.20	15	7
1.10-1.20	10	5
1.0-1.10	5	2
Decline	0	0

Highway Orientation (Maximum Value 15)

2 major highways passing through abatement zone	15
1 major highway passing through abatement zone	10

Recreation Area Relationship (Maximum Value 60)

Major recreation areas inside a pollution abatement zone or immediately affected by pollution from adjacent zone, add the following score to abatement zone:

Each existing or proposed recreation area scores 3 up to a maximum of five areas per zone	15
The score for each recreation area with water recreation activities is doubled, up to a maximum of	15
Land acreage of recreation areas; rating scale to be determined, 1/ up to a maximum of	10
Number of parking spaces; rating scale to be determined, 1/ up to a maximum of	20

It has been found in recreation visitor studies that the presence of water recreation facilities, land acreage, and amount of parking space are among the most important variables explaining visits to recreation areas.

1/ When the information has been assembled for all recreation areas.

D. Effort Index

The purpose of rating effort in the priority system is to reward communities for past environmental improvements, to provide an incentive for future effort, and to help protect resource investments made in the past by steering pollution abatement projects to the same locations in the Basin.

The kind of improvements and investments recognized as efforts and considered for protection are water resource projects and economic development investments. Other efforts include existence and enforcement of environmental regulations, plans and programs, and citizen activities for environmental improvements. The principle of rewards and incentives implies positive values as well as penalties. Where appropriate, minus values are used.

Composition of Index and Assignment of Values

The basic effort categories and their values are:

	Value
1. Environmental development projects	20
2. Economic development investment	25
3. Environmental regulations and pollution abatement programs	15
4. Observance and enforcement of environmental laws and regulations	25
5. Surveys and planning activities	10
6. Citizen effort	5
	100

The counties in the Basin were chosen as the basic geographic area in which to combine efforts and by which to measure effort because much of the data is readily available on a county basis, and because activities within a county provide a good indication of the attitudes of the people about their concern for the environment.

1. Environmental Development Projects: Maximum Value 25

Past resource investments should be protected from environmental degradation and planned resource development projects should be supported by environmental improvements. Developments such as major highways and recreation areas have already been assessed and rated in the procedure, therefore, only two types of environmental projects are included here - water resources and mine area reclamation.

Some 50 completed and planned water resource investments in the Basin have been identified by use and by agency, i.e. flood control, water supply, water qualify, power, navigation, low flow augmentation, fish and wildlife. These projects are listed (Appendix B) and their locations are mapped (Figure 5). Mine area reclamation projects, completed and planned, have yet to be identified.

The variety of uses for which the water resource investments are made, the differences in timing and therefore costs, and the different impacts experienced make it impractical to use, for this procedure, the dollars spent as the unit of measurement. Instead, values are assigned on a per-project basis as follows:

Within Each County:

Completed projects earn a score of 4, up to a maximum of 4 projects	16
Planned and committed projects earn a score of 1, up to maximum of 4 projects	4
	20

2. Economic Development Investment: Maximum Value 25

The most practical and readily available indicator of economic development investments is the expenditure made through the Appalachian Regional Development Program. The program covers a broad range of projects, and they are selected as those most relevant to economic development, as directed by Congress. Only two types of projects will be deleted from the investments - the Appalachian Development Highways - because the major highways are considered separately in other parts of the priority procedure, and - mine area reclamation projects - because they are considered under Environmental Development Projects.

Total expenditures under the program since the inception of the Appalachian Regional Commission's activities will be assigned to each of the counties in the Basin. Total expenditures are to include funds from ARC, other Federal outlays, and state and local contributions.

The total amount of investments made in each county under the Appalachian Regional Development Program will then be ranked from highest to lowest and counties will be scored as follows:

Group of Counties	Value
Top 3 Counties	25
Next 3 Counties	20
Next 3 Counties	15
Next 3 Counties	10
Next 3 Counties	5
Lowest 3 Counties	0

Appendix C lists the counties with total Appalachian Regional Development Program investments.

3. Environmental Regulations and Pollution Abatement Programs: Maximum Value Range 15 to -8

While the first two efforts assess major resource and economic investments this third part of the effort index considers the existence of environmental legislation and abatement programs both of which are designed to improve and protect the environment. Together the extent of the efforts indicate the expressed public concern, locally and statewide, for the control of environmental degradation, and the willingness of the public to take action for the improvement of the environment.

Regulations and the initiation of programs are the prerogative of all three levels of government - state, county, and municipal; aside from Federal regulations and programs which are Basin-wide. Yet the adopted geographic unit for measuring effort is the county. In assigning effort values for the existence of environmental regulations and for environmental programs the determining factor will be the proportion of the people in the county covered by the various efforts. Due to the importance of laws and of regulations, their absence is rated by negative values.

a. Environmental Regulations: 8 to -8

The regulations for water, land, and air are considered separately. The type of regulations include, for water - clean stream laws, for land - zoning ordinances, subdivision regulations, solid waste disposal ordinances, and for air - ordinances controlling burning of domestic waste, and state or local air pollution laws. A certain discretion will have to be used in the assignment of values, depending on the prevalence of environmental blights, i.e. where mining subsidence is a problem one would look for building or zoning codes which prevent building on land subject to subsidence. Conversely, no penalty points would be assigned for the absence of such regulations if there is no land in danger of subsidence.

	Environmental Legislation					
	Water			Land		
	All Types	Some	None	All Types	Some	None
100% of County Population Covered	3	2	-3	3	2	-3
Over 50% of County Pop. Covered	2	1	-2	2	1	-2
Less than 50% of County Pop. Covered	1	0	-1	1	0	-1

Air		
All	Some	None
2	-1	-2
1	-1	-2
0	-1	-2

b. Pollution Abatement Programs: Maximum Value 7

Abatement program efforts are treated in the same manner as regulations, the number of people affected by the various programs determines the score. Highest value is given for measured impact of program. No penalty points are given in this section because there may be no need for some programs in certain areas.

Pollution Abatement Programs

	Water			Land			Air	
	Measured Impact	Some	None	Measured Impact	Some	None	Measured Impact	None
100% of County Population Covered	3	2	0	3	2	0	1	0
Over 50% of County Pop. Covered	2	1	0	2	1	0	0	0
Less than 50% of County Pop. Covered	1	0	0	1	0	0	0	0

4. Observance and Enforcement of Environmental Laws and Regulations: Maximum Value Range 25 to -25

The procedure includes an assessment of the degree of compliance with laws, and the enforcement of laws and regulations. It will measure violations of laws and existing enforcement efforts. Annual evaluation can establish the effectiveness of improved and intensified law enforcement measures which may be partially funded by the Appalachian Regional Commission.

Two indicators are used - amount of illegal pollution and law enforcement activities - to provide a score for each county.

a. Illegal Pollution: 15 to -15

The pollution inventory provides the necessary information on every type of illegal pollution. For each major pollution the counties are to be ranked in order of least (or no) to most amount of illegal pollution. Because of the widespread effect of water pollution, and the generally more serious nature of water pollution in the river basin, the score values for water pollution are set at double the value of land and air pollution combined. Therefore, a combined county ranking is used for land and air pollution.

The scores by rank order of counties are:

Rank Order	Score	
Least Amount of Illegal Pollution	Water	Land & Air
Best County	10	5
Next to Best County	8	4
Next Two Counties	6	3
Next Two Counties	4	2
Next Two Counties	2	1
Next Two Counties	0	0
Next Two Counties	-2	-1
Next Two Counties	-4	-2
Next Two Counties	-6	-3
Next to Worst County	-8	-4
Worst County	-10	-5

b. Law Enforcement Activities: 10 to -10

The law enforcement activities effort indicator consists of two parts: (1) the adequacy of the pollution sampling and monitoring system, and (2) the frequency of sampling and inspections. Values are again assigned by county rank order.

Basin-wide information about the pollution inspection and monitoring system has yet to be assembled in order to establish criteria for comparison between counties. The suggested scoring by county rank order is:

(1) Comprehensiveness of sampling and monitoring system, i.e. amount of equipment, number of stations, laboratory facilities. Maximum of 5 to -5

(2) Method and frequency of inspection and sampling Maximum of 5 to -5

5. Surveys and Planning Activities: Maximum Value 10

Just as in the case of environmental regulations, the extent to which a county or town engages in finding out the facts about environmental degradation and prepares to deal with them is a measure of its effort to protect against future problems.

The public activities covered in this section include physical planning, environmental planning, and economic planning. Many of these activities are performed by the county government for the whole county, or separately by municipalities for the towns and by the county for the balance of the area in the county, or also, in many instances plans are prepared for several counties by multi-county organizations, or finally, the state government may provide the technical services. In the last two cases the smaller and financially weaker towns and counties, which normally cannot afford permanent staff, obtain sound plans. Whatever the arrangements for getting the necessary job done the existence of plans and surveys is recognized and scored by the extent of the county coverage.

	Surveys and Plans		
	YES		NO
	For the Whole County	Part of County Only	
Environmental Blight Survey	2	1	0
Comprehensive Land Use Plan (701)	2	1	0
Overall Economic Development Plan	2	1	0
Resource Conservation & Development Program	2	1	0
Solid Waste, Sewage Treatment or other Environmental Improvement Plan	2	1	0

6. Citizen Effort: Maximum Value 5

Non-governmental efforts to protect and to clean-up past neglect have been extraordinarily successful. Whether as chapters of national organizations or purely local volunteer groups their activities, if well directed, can assure that existing laws are enforced and organize annual clean-up operations. These efforts must be recognized according to measured impact and values assigned by improvement achieved, not by membership.

None	0
Some	2
Measured Impact	5

Application of Effort Index

For each county an effort value will be obtained when all six categories have been assessed. That value can be applied to the pollution abatement zones in the respective counties. When an abatement zone lies in more than one county the county index of each county covered by the zone will be applied on a proportionate basis. For example, if a zone lies 30 percent in one county and 70 percent in another, the county effort index of the first would be multiplied by 30, and the county effort index of the second multiplied by 70. The result of the two multiplications would be added together and divided by 100 to obtain the composite effort index for that abatement zone.

E. The Composite Zone Rating

When the zones have been scored according to each of the three sets of criteria - pollution, significance, and effort - their respective scores must be transposed into a form which permits comparability and combination into a single composite rating for each zone.

A fairly simple way of accomplishing this would be to make three arrays of the zones - one for each of the sets of criteria - ranging from highest score to lowest.

Zone	Score	Cumulative % of Total Score Points for All Zones
n	Highest	
↓	↓	
Z	Lowest	100
All	Total Score Points	100

Quartiles would then be marked off and those few zones which together received the top 25 percent of the score points would get a rating 4. The next group of zones, in the second quartile, would get 3 ratings. Zones in the third quartile would get 2. The fourth quartile group, which will be the most numerous, will have ratings of 1.

In summing the scores for each pollution abatement zone, the significance rating is to be counted twice as heavily as ratings under the pollution and effort criteria. This is to reflect the Appalachian Regional Commission's emphasis on support of economic development in the pollution-impacted areas.

Zone	Pollution Rating (1 to 4)	Significance Rating x2 (2 to 8)	Effort Rating (1 to 4)	Total Combined Rating (4 to 16)
n				
z				

If once more the zones are arrayed, highest combined rating to lowest, the list that results will provide the basic priorities.

F. Identification of Projects and Funding Policy Determination

The next step will be to identify the priority projects for the respective abatement zones. This task will be informed and guided by the summaries developed in the pollutant scoring process. Thus the range of possible projects can be viewed against the background of geographical priorities within the river basin and also in the context of overall environmental conditions in the respective impact areas.

Some of these projects will come within the purview of other Federal agencies. Some will be most appropriately handled by the states or local governments. Others, such as the sealing of draining, inactive mines represent a major effort for which the Appalachian Regional Commission may accept primary responsibility. When effectiveness in the impact area is taken as a primary criterion for environmental improvement, however, there are categories of problems and solutions which either fall between the clear-cut lines of traditional authority or fall where resources are insufficient to cope with them. The Commission is in a uniquely strategic position to see that these receive the attention they need. One example might be funding the capital cost of basic equipment or testing facilities essential for law enforcement. Another might be subsidizing the local share of a critical municipal sewage treatment plant that otherwise would not be built for many years to come, if at all.

Here is the point in the process where the ARC considers its funding policy choices and injects its decisions on areas of emphasis.

G. Project Selection

1. Early Action and Subsequent Projects

Having established the nature of projects to be considered for ARC funding, the conditions governing their eligibility and the manner of administering the ARC aid, the Commission will be ready to proceed with the next step.

This will be to outline, for law enforcement projects (which affect all pollution sources) and for each pollution abatement zone an early action program and a subsequent action program. Included will be only those sorts of projects which ARC has determined it will support. Because ARC's funding comes on an annual basis, early action would be interpreted as first-year priority work. Subsequent action would comprise a five-year view into the future.

The purpose of the abatement program is to achieve certain quality standards. For each pollution abatement zone the most rapid improvement for a given investment may be achieved by dealing with the heaviest pollution source loads first for each type of pollutant. This application of the law of diminishing returns has been in use and tested, in the case of mine acid drainage abatement, by the Wheeling Field Office of the Environmental Protection Agency. In summary:

> "Loads from each source vary dramatically from zero to thousands of pounds per day. If all other aspects of the sources are equal, the most economical solution would be to work on the largest source loads first, then include lesser loads down to the most economical level. The optimum level of pollution load control, when load is the only factor, may be obtained by:
>
> 1. organizing the load data from the largest to the smallest
> 2. preparing a table listing the cumulative total of load sources from largest to smallest
> 3. calculating from this data the percent of total load and the percent of total sites at various points in the list
> 4. plotting a graph on equal axes, 100 units on each, using the percentile data
> 5. drawing a 45° line tangent to the curve.

The coordinates of the point of tangency indicate the optimum level of control." 1/

By this method it is possible in some areas to eliminate 85 percent of the acid discharge by treating only 15 percent of the sources.

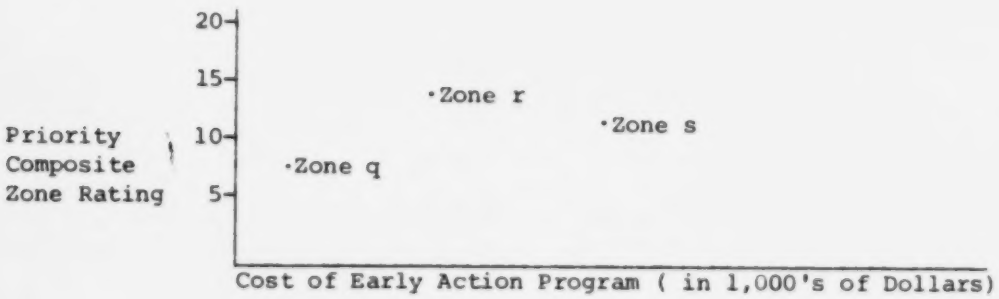
To work towards the established quality standards in pollution abatement zones this method of project selection should be used for all types of pollutants.

2. Estimating Costs of Early Action Programs

Costs estimates for the component projects in the early action programs - for law enforcement and for the individual pollution abatement zones - are then totaled to get a general price range for each early action "package." A similar exercise may be done for the subsequent action packages. This will provide a longer range expense picture for future planning and budget requests.

3. Priority/Cost Comparisons

With these data a scatter diagram can be constructed. For each pollution abatement zone the position of its early action program would be plotted, zone priority rating (y-axis) against dollar price (x-axis). The law enforcement package would be assigned a priority rating of 20, and would be plotted along with the zone packages as an additional project.



1/ Gary V. Bryant, Determining Level of Control of Pollution Sources by Load, unpublished, Wheeling Field Office, Environmental Protection Agency, January, 1970.

The allocation of funds might thus be presented graphically. Starting from the upper left corner, the highest priority, lowest cost packages would be picked up until the total costs match the available budget.

Priority/cost ratios for early action programs would be computed arithmetically and arrayed, highest to lowest, next to respective cost figures for the respective packages and cumulative totals. When

Zone	Priority/Cost Ratio	Early Action Program Cost	Cumulative Cost Totals
Law Enforcement (All Zones)	Highest		
Zone n			
Zone z	Lowest		

the ARC budget limit falls short of an integral zone package then the divided last zone might be dropped from the allocation. Alternatively, the package components for all the zones heading the list could be reviewed with an eye toward deleting individual projects so that the divided zone could be included.

H. Updating of Inventories and Evaluation of Abatement Projects

The procedure is a prescription for an investment process. It does not establish once and for all a fixed order of project priorities. Economic, pollution, and effort circumstances change, and these changes will be reflected in the altered order of project importance. It is necessary, therefore, to update the priority factor information regularly, particularly the pollution and effort information.

The updating operation will also help to measure the success of abatement projects. The results of projects can be assessed from readings at stream sample stations and other quality measure records. An evaluation is the only way to test what are now assumptions, i.e. that economic development is spurred by environmental improvements, or what are untried water management criteria, i.e. the control of environmental degradation by means of background standards. The evaluation can check the progress toward the achievement of adopted

quality standards and may indicate where and when standards may be raised in some parts of the Basin.

Finally, it is suggested that the updating and evaluation procedures be linked to the preparation of environmental impact statements required under Section 102 (2)(C) of the National Environmental Policy Act.

APPENDIX A - Economy of Sub-Basins

SUB-BASIN I - Greater Pittsburgh

Location

The Greater Pittsburgh Sub-Basin covers 892 square miles in the northern region of the Monongahela River Basin. It includes portions of Allegheny, Washington, Westmoreland, and Fayette Counties in Pennsylvania. The dominant river flowing through the region south to north is the Monongahela. A second major tributary is the Youghiogheny which joins the Monongahela at McKeesport. The minor sub-basins within Sub-Basin I are Lower Monongahela, the Lower Youghiogheny, Sewickley Creek, Middle Youghiogheny.

Population

The 1970 population of the sub-basin was 1,061,000. Average density is 1,189 persons per square mile. Population during the 1960-70 decade was stable. ARC projections based on 1960 census figures show a slight increase in population between 1960 and 1985.

Greater Pittsburgh Sub-Basin, Projected Population 1960-1985

Year	1960	1970	1975	1980	1985
Pop.	1,062,000	1,021,000	1,025,000	1,031,000	1,083,000

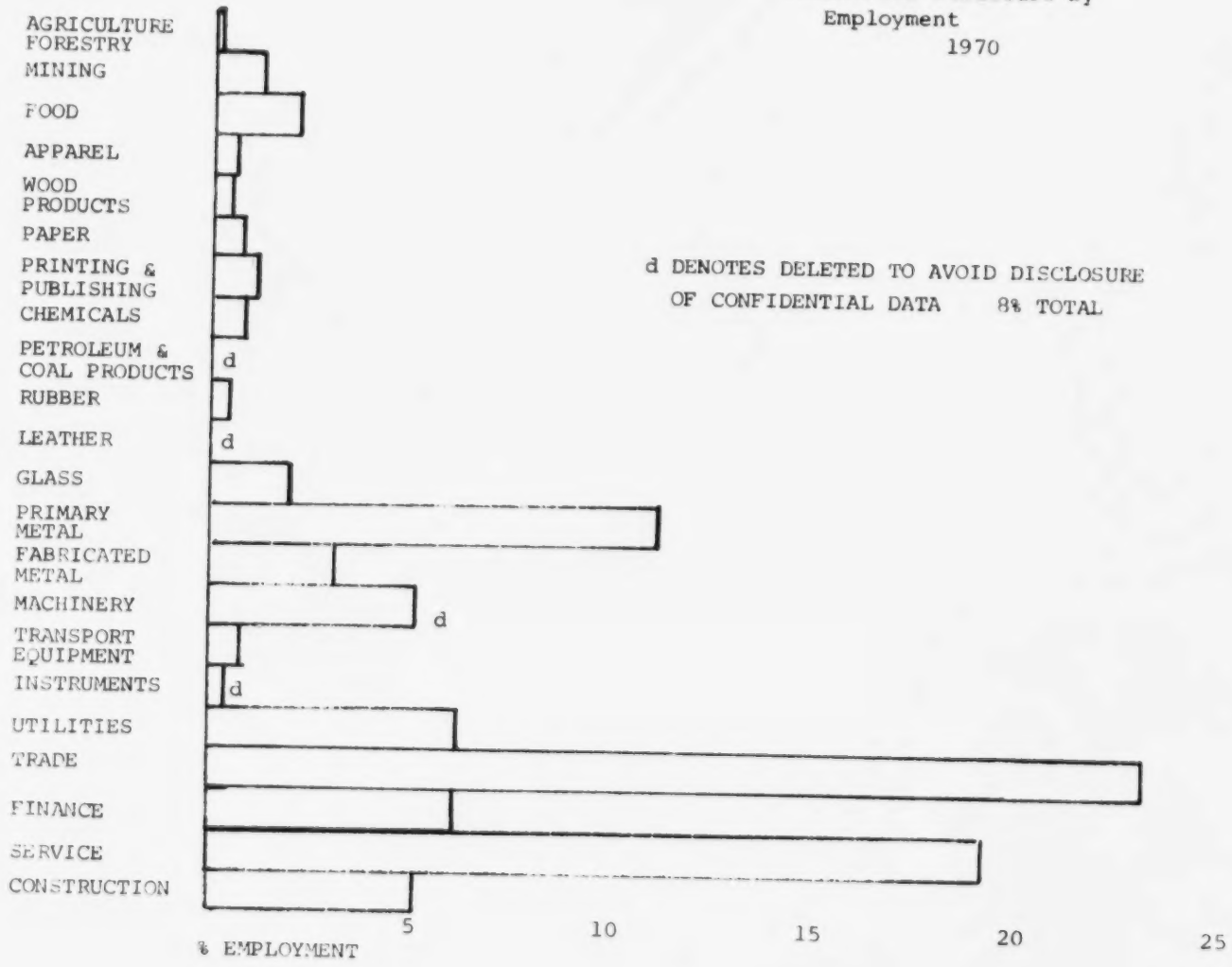
Source: ARC

Growth ratio for Sub-Basin I is 1.01 for the 1960-85 period according to ARC figures.

Employment

Primary industries in the Greater Pittsburgh Sub-Basin are of minor employment importance. Employment in secondary industries is dominated by primary metal products and machinery including electric. In ranked order of employment importance are: fabricated metal products, food, glass, printing and publishing, transportation equipment, chemicals, paper, instruments, apparel, lumber and furniture, rubber and plastic, petroleum and coil products and leather. Tertiary activities employ the greatest numbers of people in Sub-Basin I. Trade and service rank the most important followed by finance, insurance and real estate, transportation and utilities, and construction. The current unemployment rate is 6.3.

Greater Pittsburgh Sub-Basin I
Industrial Structure by
Employment
1970



d DENOTES DELETED TO AVOID DISCLOSURE
OF CONFIDENTIAL DATA 8% TOTAL

Greater Pittsburgh Sub-Basin I
Industrial Structure

Industry	Employment
Agriculture	447
Mining	3,678
Manufacturing	
Food	6,624
Apparel	1,469
Lumber & Furniture	966
Paper	1,997
Printing and Publishing	4,017
Chemicals	2,167
Petroleum and Coal Products	302
Rubber and Plastic	1,485
Leather	64
Stone, Clay, Glass	5,936
Primary Metals	36,897
Fabricated Metals	10,224
All Machinery	18,687
Transportation Equipment	2,312
Instruments	1,358
Transportation and Utilities	21,234
Trade	86,338
Finance, Insurance, Real Estate	18,963
Services	64,290
Construction	17,591

Source: County Business Patterns 1970

Industrial Earnings

The total earning growth ratio for the sub-basin is 2.95 according to OBE estimates for the years 1959-90. Trade and services are greatest earning activities and will continue to be throughout the 1959-90 period. Machinery, glass products, transportation equipment, and fabricated metals will be highest earning manufacturing activities. Mining and construction also rank among the top seven activities in earnings.

Per Capita Income

Per capita income in the Greater Pittsburgh Sub-Basin is higher than other sub-basin income in the Monongahela River Basin. Income remains highest throughout the projected period, although rate of growth for the period is lowest of other sub-basins.

Greater Pittsburgh Sub-Basin Per Capita Income, 1959-1985 (1967$)

Year	1959	1967	1970	1975	1980	1985
$	2,625	3,340	3,361	4,293	5,032	5,708

Source: ARC

Growth ratio for 1959-85 is 2.18.

GREATER PITTSBURGH SUB-BASIN I
Industrial Growth in Earnings

1959-1990 in 1,000's of 1967$

	1959	1962	1967	1968	1980	1990
Agriculture	12,592	8,653	9,456	5,539	11,108	10,583
Mining	25,804	21,704	25,887	26,030	31,810	37,161
Manufacturing						
Food	8,491	7,980	8,061	8,663	10,491	12,480
Apparel	2,809	3,453	3,928	4,568	6,515	8,948
Lumber & Furniture	2,505	2,882	3,468	3,531	6,348	9,016
Paper	1,022	1,814	2,489	1,839	4,020	6,141
Printing & Publishing	3,725	3,861	6,381	6,777	10,301	14,696
Chemicals	2,356	2,278	5,407	4,539	6,063	12,512
Glass	20,691	24,359	25,254	24,943	33,706	42,761
Primary Metal	6,734	6,482	7,359	7,540	10,936	14,276
Fabricated Metal	11,138	11,787	15,245	15,841	21,210	28,784
All Machinery	20,370	21,156	29,012	28,842	72,442	116,787
Transportation Equip.	2,637	3,150	4,702	4,439	12,651	22,358
Trade	80,587	79,952	94,284	96,400	162,372	230,604
Service	54,209	55,318	77,834	80,501	146,363	217,575
Construction	24,364	19,975	46,182	42,123	58,424	68,500

SOURCE: Office of Business Economics

Accessibility

The Greater Pittsburgh Sub-Basin is well served by all types of transportation. Interstate 70 and 76 provide east-west access. Bureau of Public Roads 1966 average daily traffic projections estimate an increase of about 60 percent on I-70 by 1990. These projections are being currently updated. I-76 average daily traffic is estimated to increase over 40 percent between 1970 and 1990 through the Pittsburgh area. North-south access is currently provided by U.S. Routes 40 and 119 and will be greately improved with the completion of I-79.

Four major railroad lines offer freight service to the sub-basin. The region is served by Greater Pittsburgh Airport, Allegheny County Airport, and Rostraver Airport for private and corporate aircraft. The Monongahela River is navigable through the sub-basin. 27 million tons of coal, steel, sand, gravel and chemicals are transported annually, making it one of the busiest rivers in the world.

Growth Centers

Designated growth centers include a regional center, the portion of Allegheny County located in Sub-Basin I, and two adjoining towns,

Greensburg and Jeanette. During the 1960-70 decade the growth centers declined in population. Allegheny County declined 1.4 percent, Jeanette and Greensburg declined 8 percent. ARC population projections estimate a continued decline in the Monongahela portion of the Allegheny regional center and primary trade area and an increase in the Jeanette-Greensburg growth centers with their primary trade areas.

Growth Centers and Primary Trade Area Population Change, 1960-85

	1960	1967	1970	1975	1980	1985
Allegheny County	812,550	771,600	772,200	770,900	775,450	803,350
Jeanette-Greensburg	352,600	374,200	368,600	374,500	392,000	419,800

Source: ARC

1970 population in the Monongahela portion of Allegheny regional center was 82,500. This regional center is a trade and manufacturing center at the point where the Monongahela River joins the Allegheny River to form the Ohio. It is principally a steel making center, but industry is well diversified. The large dense population within the sub-basin provides a ready market for goods and services offered in the center. The region is served by Interstate 70 and 76. Interstate 79 under construction and Appalachian Corridor M will increase accessibility. Air service is available through three public and private airports. Rail service is offered by four major lines and the Monongahela River traffic contributes to Pittsburgh's standing as America's largest inland port.

Sources of supply for municipal water are the Youghiogheny and Monongahela Rivers. Flow at the intake point is adequate for present and future needs.

The Monongahela River and its tributaries are receiving streams for eight treatment plants in the regional growth center: Bethel Municipal plants treats sewage for 17,000 persons. Piney Fork which flows into Peters Creek and then into the Monongahela, receives two million gallons of intermediate treated sewage. The plant plans to upgrade its treatment to secondary in the near future with capacity for 20,000 persons. Dravosburg treatment plant serves 3,500 persons, 350,000 gallons of intermediate treated sewage is put into the Monongahela daily. A secondary plant is planned to serve 4,800 persons. Elizabeth Borough plant provides intermediate treatment for 3,500 people. 330,000 gallons are discharged into the Monongahela River daily. The plant will be upgraded to secondary treatment to serve 8,000 persons. Elizabeth Township plant provides intermediate treatment for 3,500 people. The Youghiogheny River receives 300,000 million gallons daily. Glassport provides intermediate treatment for 8,000 persons. 800,000 million

gallons are discharged into the Monongahela daily. Duquesne serves 15,000 persons. 800,000 gallons of secondary treated sewage are discharged into the Monongahela daily. McKessport provides intermediate treatment for 80,000 persons. 4,750,000 gallons are discharged into the Monongahela River daily.

Jeanette-Greensburg

Jeanette and Greensburg are industrial towns. Jeanette population in 1970 was 15,209, and Greensburg population was 15,870. It is likely the two towns may form one urban complex if estimated growth does take place. They are served by U.S. Routes 30 and 119. Interstate 76 traffic at Jeanette is estimated to increase 47 percent between 1970 and 1990 according to Bureau of Public Roads projections. Appalachian Corridor M will improve the accessibility of Greensburg.

Jeanette and Greensburg receive municipal water from the Westmoreland Water Company. Jeanette waste treatment is insufficient and an upgrade order was issued in June, 1971. Jacks Run is receiving stream for secondary and clorinated treated waste for 24,000 persons served by Greensburg. An upgrade order was also issued to this plant in June, 1971. Required flow for waste assimilation will be insufficient for estimated demand in the Year 2020.

SUB-BASIN II - Monongahela

Location

The Monongahela Major Sub-Basin covers 1,453 square miles in the western portion of the Monongahela River Basin. It includes Greene County and parts of Fayette and Washington Counties in Pennsylvania, and Monongalia and parts of Marion and Preston Counties in West Virginia. Included are minor sub-basins: Redstone and Dunlap Creeks, Tenmile Creek, Middle Monongahela River, Dunkard Creek, Upper Monongahela River, Buffalo and Paw Paw Creeks. The major river, flowing south to north through the area is the Monongahela.

Population

The 1970 population of the area was 273,000; average density was 188 persons per square mile. Population declined during the 1960-70 decade 15.4 percent. ARC projections for the sub-basin, based on 1960 census figures, estimate a gradual decline until 1980, and then annual increase through 1985.

Monongahela Sub-Basin Projected Population 1960-85

Year	1960	1970	1975	1980	1985
Pop.	283,000	280,000	275,000	274,000	281,000

Source: ARC

Growth ratio for the 1960-85 period is .99 (Ratio less than 1 indicates decline.)

Employment

Primary industries make up 17 percent of disclosed employment, the highest percentage among the Monongahela Major Sub-Basins. Coal mining is most important. Agriculture and forestry are declining.

Secondary industries make up 29 percent of disclosed employment. Glass manufacturing is most important. Apparel, fabricated metal products, machinery including electric, primary metals, food, transportation equipment, lumber and furniture, printing and publishing, chemicals, paper and instruments manufacturing are ranked by numbers employed.

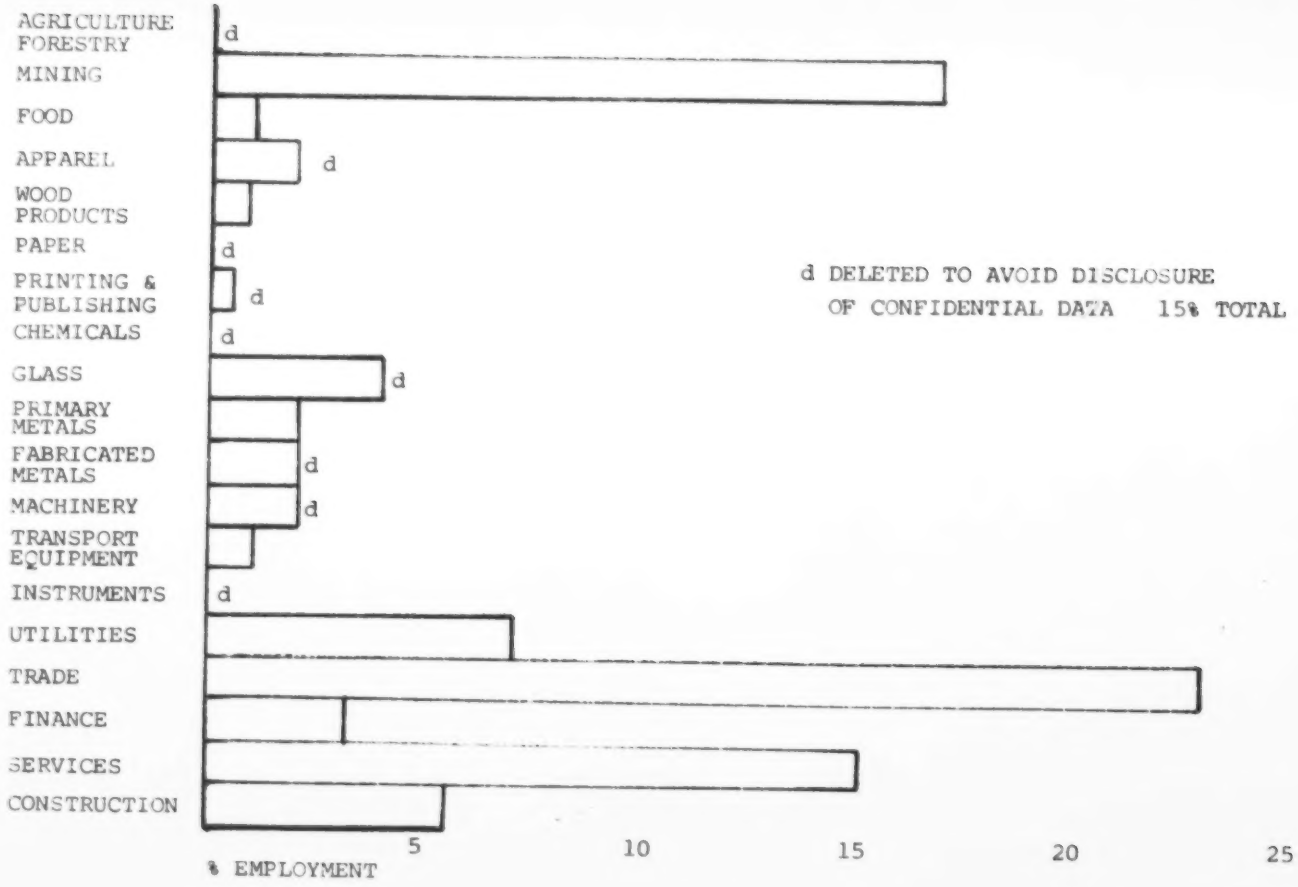
Monongahela Sub-Basin II
Industrial Structure

Industry	Employment
Agriculture and Forestry	24+D
Mining	9,340
Manufacturing	
Food	690
Apparel	971+D
Lumber and Furniture	439
Paper	33+D
Printing and Publishing	204+D
Chemicals	38+D
Stone, Clay, Glass	1,931+D
Primary Metal	981
Fabricated Metal	815+D
All Machinery	1,226+D
Transportation Equipment	651
Instruments	D
Transportation and Utilities	3,981
Trade	12,725
Finance, Insurance, Real Estate	1,888
Services	8,284
Construction	3,088

D = undisclosed

Source: County Business Patterns 1970

Monongahela Sub-Basin II
Industrial Structure by
Employment
1970



d DELETED TO AVOID DISCLOSURE
OF CONFIDENTIAL DATA 15% TOTAL

Tertiary industries make up 54 percent of disclosed employment. Trade dominates this sector and accounts for 25 percent of total employment. Services, utilities, construction and finance, insurance and real estate are also important. Unemployment rate for 1971 was 6.7.

Industrial Earnings

The leading industry in earnings in Sub-Basin II is mining. Office of Business Economics estimates mining will continue to lead all industries in earnings through 1990. Trade, service, glass products, and construction are ranked leading industries in earnings through 1990. Machinery and transportation equipment will become increasingly important throughout the 1968 to 1990 period. Earnings growth ratio for the 1959-1990 period is 2.06 using OBE estimates.

MONONGAHELA SUB-BASIN II
Industrial Growth in Earnings

1959-1990 in 1,000's of 1967$

	1959	1962	1967	1968	1980	1990
Agriculture & forestry	599	412	450	263	528	503
Mining	63,896	53,742	64,101	64,455	78,767	92,017
Manufacturing						
Food	838	788	796	855	1,036	1,232
Apparel	1,872	2,302	2,619	3,045	4,343	5,965
Furniture & lumber	1,163	1,059	1,610	1,639	2,947	4,186
Paper	20	36	50	36	81	124
Printing & publishing	206	214	354	376	572	816
Chemicals	48	46	110	92	182	254
Glass	6,747	7,943	8,235	8,134	10,991	13.944
Primary metal	1,836	1,767	2,007	2,056	2,982	3,893
Fabricated metal	885	937	1,212	1,260	1,687	2,289
All machinery	1,328	1,379	1,892	1,881	4,724	7,616
Transportation equip.	753	900	1,343	1,269	3,614	6,388
Trade	11,663	11,572	13,646	13,952	23,501	33,326
Service	6,861	7,002	9,852	10,190	18,527	27,541
Construction	1,167	3,416	7,899	7,205	9,993	11,718

Source: Office of Business Economics

Per Capita Income

Income per capita ranks third among all Monongahela Sub-Basins. This rank is held throughout the 1959-1985 period. Income rate of growth ranks fifth among the six sub-basins. Since three of the larger industrial cities in the Monongahela Basin are located within Sub-Basin II, it appears that, relative to other sub-basins, income per capita should rank higher in both actual dollars and growth rate. However, over 70 percent of the population of the sub-basin does not live within these higher earning centers and rural incomes lower the expected average income.

Monongahela Sub-Basin Per Capita Income, 1959-1985 (1967$)

Year	1959	1967	1970	1975	1980	1985
$	1,882	2,362	2,630	3,115	3,725	4,391

Source: ARC

Growth ratio for the 1959-1985 period using ARC estimates is 2.33.

Accessibility

Sub-Basin II is currently served by U.S. Routes 250, 19 and 119 north-south and Route 40 east-west. Completion of north-south Interstate 79 and east-west Appalachian Corridor E will increase accessibility to the region. Air service includes a local service airport at Morgantown which will be improved to "gateway" status by 1981. General aviation airports include publicly owned airports in Green and Marion Counties and a privately owned airport in Fayette County. The Monongahela is navigable from Fairmont north through Sub-Basin II and is used for freight movements between river ports and into Pittsburgh. A large network of rail trackage is available and is under study for more efficient use.

Growth Centers

29 percent of the population within Monongahela Sub-Basin II resides in the four designated growth centers. Morgantown, the largest, has shown a 30.9 percent increase in population over the 1960-70 decade. Fairmont has declined 5 percent. Uniontown has declined 9.3 percent and Waynesburg declined .7 percent according to U.S. 1970 census. U.S. Department of Housing and Urban Development has proposed a new town called Briarhill to be built as a demonstration town between Uniontown and Brownsville. Its population would be 20,000. This town should also qualify as an additional growth center in Sub-Basin II when construction commences.

Appalachian Regional Commission population projections based on 1960 figures estimate that Fairmont and Morgantown and their primary trade areas will increase in population during the 1960-85 period. Uniontown and Waynesburg and their primary trade areas are expected to decline.

Growth Centers and Primary Trade Area Population Change, 1960-1985

	1960	1967	1970	1975	1980	1985
Fairmont	63,700	68,600	68,000	69,600	70,300	73,200
Morgantown	51,300	56,000	56,900	59,700	62,700	65,900
Uniontown	140,600	140,000	135,700	127,700	122,400	119,800
Waynesburg	15,600	13,000	12,500	12,300	11,900	12,300

Source: ARC

Growth ratios using ARC figures are: Fairmont 1.4, Morgantown 1.28, Uniontown .85, and Waynesburg .78. (Ratios less than 1 indicate decline.)

Fairmont (1970 Population - 26,093)

Fairmont is a trade, service and manufacturing center, the second largest city in Sub-Basin II. Its service activities include county government functions as the County Seat of Marion County and education functions as the location of Fairmont State College with 3,300 students. Fairmont manufactures glass, aluminum, fluorescent tubes and sealed beam lamps, and a variety of other products. Fairmont is accessible from the north and south by U.S. Route 19 and from the northwest by U.S. Route 25. Completion of Interstate 79 will improve access from north and south. Bureau of Public Roads 1966 projections estimate 21,190 vehicles daily average on four lane Interstate 79 by 1990. This 103 percent increase over 1970 traffic is considered low and projections are currently being updated. Fairmont Municipal Airport is a publicly owned general aviation airport located three miles south of the city. Although its location is within Sub-Basin IV, it serves persons in Sub-Basin II.

Fairmont is the upstream terminus of the navigable portion of the Monongahela River.

Fairmont municipal water system serves 50,000 persons. The Tygart Valley River provides source of supply and flow is sufficient for current and future uses. The Monongahela River is receiving stream for 25,000 persons served by Fairmont municipal sewage system. As of 1963 no treatment was provided. Current treatment does not meet standards and facilities must be upgraded. Many small package treatment plants are in use and being completed in small communities throughout Marion County so that river quality in Marion County is being upgraded.

Morgantown (1970 Population - 29,431)

Morgantown is a trade, service and manufacturing center. Service activities include government functions as the seat of Monongalia County, education functions at West Virginia University with 20,800 students, a Forest Services Laboratory, a Bureau of Mines Research Center, and the Appalachian Laboratory for Occupational Respiratory Diseases.

Morgantown has more factories producing handmade glass than any other U.S. city. Morgantown is accessible from the north and south by U.S. Routes 19 and 119. Highway accessibility will be improved by north-south Interstate 79 and Appalachian Corridor M. Bureau of Public Roads 1966 projections estimate 1990 north-south average daily traffic in the Morgantown portion of I-79 to be 20,250 vehicles. This is an increase of 98 percent over 1970 north-south traffic. East-west average daily traffic on four lane Corridor E is estimated at 37,945 vehicles in 1990 an increase of 33 percent over 1975 average daily traffic. The local service airport will be upgraded to become a "gateway" airport by 1981. River traffic becomes more important at Morgantown because controlled deeper draft between Morgantown and Pittsburgh allows larger barges and towboats to operate and density of industry served increases.

Morgantown municipal water system serves 45,000 using water from the Monongahela River, Tubbs Run and Coborn Creek. Flow is sufficient for current and future demands.

Waynesburg (1970 Population - 5, 152)

Waynesburg is a trade center in an area of coal production. Construction workers involved in power plant construction and laying gas transmission lines provide an additional current source of demand for goods and services. Waynesburg College provides education services. Waynesburg is currently accessible by north-south U.S. Route 19. North-South access will be improved by I-79. Bureau of Public Roads projections estimate 14,380 average daily traffic in the Waynesburg section by 1990. This is an increase of 88 percent over 1970 north-sough traffic. A publicly owned general aviation airport is located two miles east of Waynesburg. Rail traffic which is mostly made up of coal carrying unit trans has a negative effect upon the city. Although the 100 to 150 car trains provide an efficient method of moving coal, the town is cut off from its vital services such as police and fire protection, during the half hour periods the train disects the town. Waynesburg water source has insufficient reliable flow for future needs. Treated waste for 6,000 persons flows into Tenmile Creek. Although the treatment plant is not operating to capacity, the interceptors and collector lines are not large enough to adequately serve all areas of Waynesburg.

Uniontown (1970 Population - 16,282)

Coal and its byproducts made Uniontown prosperous, but with the decline in coal mining nearby, the city has developed a more diversified economic base.

North-south access is provided by U.S. Routes 40 and 119. Uniontown will be bypassed by I-79 and the Appalachian Corridors. However, U.S. 119 will be improved to a multi-lane controlled access route from Uniontown north to the I-70 and I-76 interchange. A privately owned general aviation airport is located near Uniontown.

Redstone Creek supplies municipal water for the City of Uniontown.

Flow is sufficient for present and projected needs. Redstone Creek is also the receiving stream for treated sewage from Uniontown. The treatment does not meet the standards and an upgrade order was issued in June of 1970. Primary and secondary treatment plants are in the planning stage.

SUB-BASIN III - Youghiogheny

Location

The Youghiogheny Sub-Basin covers 1,364 square miles in the eastern portion of the Monongahela River Basin in northern West Virginia, southwestern Pennsylvania, and western Maryland. It covers most of Garrett County, Maryland, portions of Somerset and Fayette Counties in Pennsylvania, and part of Preston County in West Virginia. The principal river flowing south to north through the area is the Youghiogheny. The sub-basin is made up of five minor sub-basins: Mounts and Indian Creeks, Youghiogheny River West, Laurel Hill Creek, Casselman River, Upper Youghiogheny.

Population

The 1970 population of the Sub-Basin was 110,000, an average density of 81 persons per square mile. Population declined 4.8 percent in the 1960-70 period; 1960-85 projections estimate a gradual decline in population.

Youghiogheny Sub-Basin Projected Population 1960-1985

Year	1960	1970	1975	1980	1985
Pop.	118,000	118,000	115,000	111,000	109,000

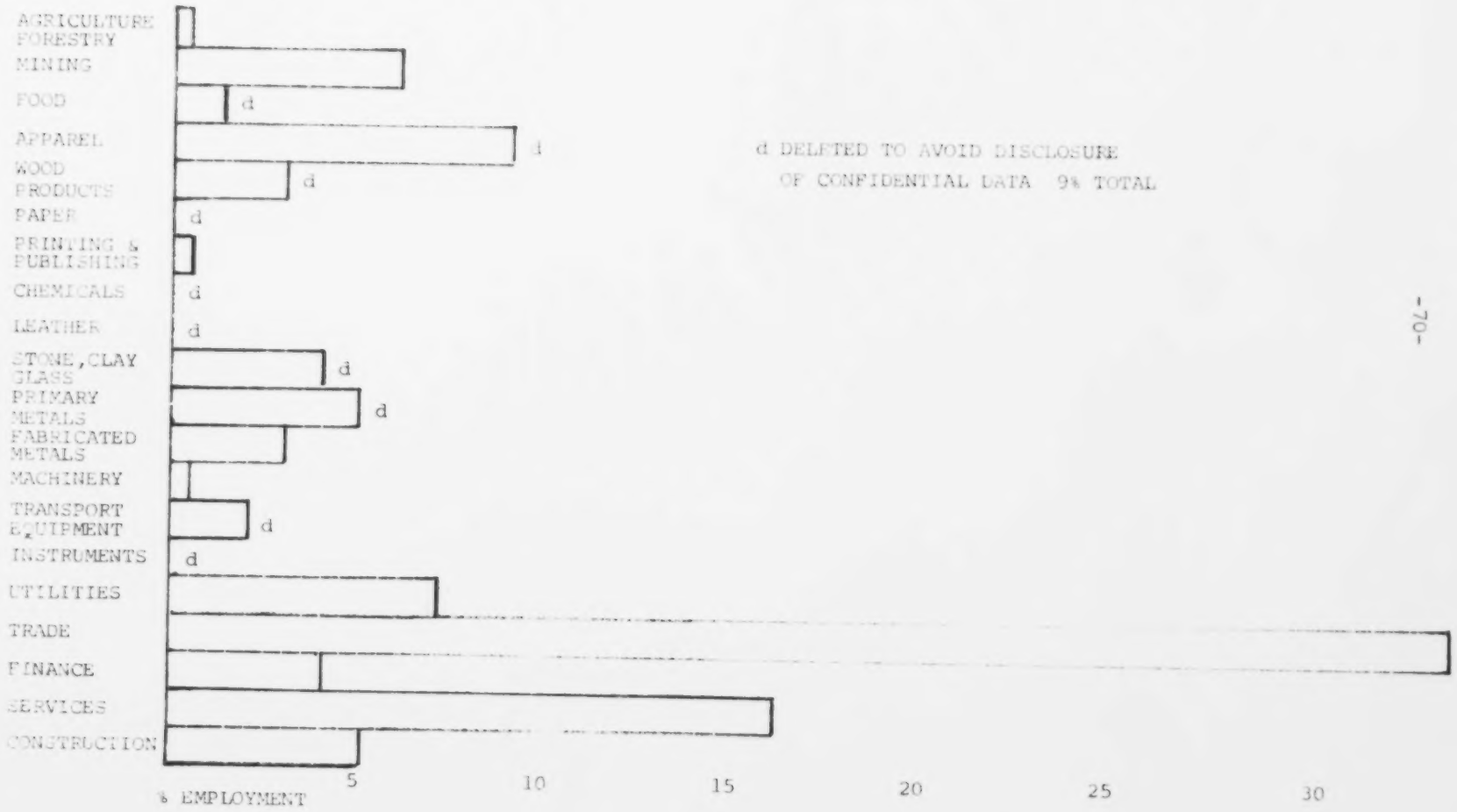
Source: ARC

Overall growth ratio for the period is .92. (Ratios less than 1 indicate decline.)

Employment

Primary industry employment in the Youghiogheny Sub-Basin is dominated by mining. This provides less than 7 percent of total employment. Secondary industries include apparel, primary metals, glass products, fabricated metals, lumber and furniture, transportation equipment, food, printing and publishing, machinery, chemicals, leather, paper and instruments in order of disclosed employment. Tertiary activities are dominated by trade which employs 34 percent of all employment. Services, utilities, construction and finance all are important. The overall orientation of the Youghiogheny is toward recreation development and this is reflected in the dominant role of tertiary activities. 1971 unemployment in the sub-basin was 9.1 percent.

Youghiogheny Sub-Basin III
Industrial Structure by
Employment
1970



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OF CONFIDENTIAL DATA 9% TOTAL

Youghiogheny Sub-Basin III
Industrial Structure

Industry	Employment
Agriculture and Forestry	40
Mining	1,036
Manufacturing	
Food	267+D
Apparel	1,668
Lumber and Furniture	518+D
Paper	D
Printing and Publishing	95
Chemicals	D
Leather	D
Stone, Clay, Glass	628+D
Primary Metal	110+D
Fabricated Metal	486
All Machinery	73
Transportation Equipment	325+D
Instruments	D
Transportation and Utilities	1,168
Trade	4,988
Finance, Insurance, Real Estate	685
Services	2,923
Construction	952

D = undisclosed

Source: County Business Patterns 1970

Industrial Earnings

Overall growth ratio for industries in the sub-basin 1959-90 is 2.64, using OBE estimated earnings. Mining, trade, apparel and service are, and continue to be, industries maintaining highest earnings throughout the 1959-90 period.

Mining, the leading industry in earnings has small growth potential so that its importance shall continue but earnings will increase only slightly. However, service, apparel, and trade which are employment leaders also have good potential earning growth.

Per Capita Income

The estimated per capita income growth rate (1959-1985) is 2.34 and ranks fourth among the six sub-basins. Amount of income also ranks fourth of the six.

YOUGHIOGHENY SUB-BASIN II
Industrial Growth in Earnings

1959-1990 in 1,000's of 1967$

	1959	1962	1967	1968	1980	1990
Agriculture	1,199	824	900	523	1,058	1,007
Mining	7,372	6,201	7,396	7,437	9,088	10,617
Manufacturing						
Food	314	295	298	320	388	462
Apparel	3,121	3,837	4,365	5,076	7,239	9,942
Lumber & Furniture	1,342	1,222	1,858	1,891	3,401	4,830
Paper	82	84	140	150	228	326
Printing & Publishing	D	D	D	D	D	D
Chemicals	2,249	2,648	2,745	2,711	3,664	4,648
Stone, Clay, Glass	174	168	190	194	284	370
Primary Metal	506	535	692	720	964	1,308
Fabricated Metal	885	920	1,261	1,254	3,149	5,077
All Machinery	376	450	671	634	1,807	3,194
Transportation Equip.	4,241	4,208	4,962	5,074	8,546	12,137
Trade	2,744	2,801	3,941	4,076	7,410	11,016
Service	1,282	1,051	2,430	2,217	3,075	3,605
Construction						

SOURCE: Office of Business Economics

D Denotes digures withheld to avoid disclosure of operations of individual reporting units.

Youghiogheny Sub-Basin Per Capita Income, 1959-1985 (1967 $)

Year	1959	1967	1970	1975	1980	1985
$	1,726	2,210	2,442	2,883	3,438	4,047

Source: ARC

Recreation

As undeveloped and accessible land areas near urban concentrations, particularly in the northeast, are being used for industry, housing, transportation and other development, the Youghiogheny Sub-Basin's importance for recreation development increases. The rapid disappearance of suitable swimming, picnic and camping places, coupled with more leisure hours and more dollars to spend on recreation, all indicate increased recreation area demand. Rapidly improving accessibility to the Youghiogheny region from major metropolitan centers, the great number and variety of existing complimentary and competing facilities easily accessible to each other, and available land suitable for recreation

development, make the Youghiogheny Sub-Basin a potential source of supply for this growing demand. The problems of seasonal employment usually associated with recreation are less important because of emphasis on winter as well as summer recreation. Recreation facility growth increases demand for trade, service, second home sites, and opens opportunities for manufacture of recreation associated goods such as the Coleman plant in Somerset. Demand for recreation in the Youghiogheny area has been projected by the ARC.

Youghiogheny Sub-Basin Recreation Area, Visitor Activity Days

Projected Visitor Activity Days From Top 25 Urban Demand Sources

1970	1975	1980	1985
12,268,700	13,811,900	15,752,900	17,945,100

In 1985, 42.08 percent of these visitor days from non-local sources will be spent in water based activities.

At the present time 15 Federal and State owned recreation facilities are located within the sub-basin. Ten privately owned facilities now are available and ten public and private facilities are planned for the near future.

Accessibility

Sub-Basin II is currently accessible from east and west by U.S. Routes 40 and 50 and from the north and south by Routes 219, 119 and Interstate 70. Corridors E and N will improve access from the north, east, and west. The substandard publicly owned general aviation airport in Garrett County will become standard by 1981. A general service airport is also located near Connellsville.

Growth Centers

The four designated growth centers in the Youghiogheny Sub-Basin are distributed around the perimeter of the region. 11.8 percent of the population of the sub-basin resides in these growth centers. Between 1960 and 1970 Connelsville population declined 9.1 percent, Myersdale population declined 8.7 percent, Somerset declined 1.2 percent, and Oakland declined 9.7 percent. ARC projections estimate Myersdale and Oakland with their trade areas will show growth between 1960 and 1985 and Connelsville and Somerset will continue to decline.

Growth Centers and Primary Trade Area Population Change, 1960-1985

	1960	1967	1970	1975	1980	1985
Connelsville	96,700	96,300	93,300	87,800	84,200	82,400
Myersdale	10,300	11,200	11,100	11,100	10,900	10,700
Oakland	9,400	10,800	11,100	11,500	11,800	12,200
Somerset	27,900	29,900	29,400	28,900	28,000	27,500

Source: ARC

Growth ratio for Connelsville is .85, Myersdale is 1.03, Oakland is 1.29, and Somerset is .98.

Connelsville, Pennsylvania (1970 Population - 11,643)

Connelsville is a trade center serving a mining, dairying and Christmas tree growing area. With increased recreation activity in the Youghiogheny Sub-Basin, Connelsville will become its northern gateway. Trade and service activities should show a response to outside visitor demands.

Connelsville is accessible from Interstate 70 by U.S. Route 119. Connelsville airport is a third-level schedule air carrier service. Rail freight service is adequate. However, passenger service terminated in 1971 although terminal facilities could be restored if service was resumed.

Connelsville municipal water supply is taken from the Youghiogheny River and Laurel Run to serve 25,000 persons. The current dependable yield is sufficient for present use and projected need. The Youghiogheny is receiving stream for municipal waste. Waste treatment does not meet standards. Reliable water flow is insufficient for projected waste assimilation demand. The Corps of Engineers' planned Upper Casselman and Laurel Hill Creek Reservoirs will provide for this deficit.

Myersdale, Pennsylvania (1970 Population - 2,648)

It is a small trade and service center on U.S. Route 219 south of Interstate 70. Corridor N will improve north-south access.

Crystal Lake serves as municipal water supply source for 3,000 persons. Present dependable yield is insufficient for current use and a .6 million gallon daily deficit is projected for year 2020. The Casselman River receives municipal waste. Secondary waste stabilization treatment does not meet standards. The Casselman flow is sufficient to meet projected demands for waste assimilation. Wills Creek is a U.S.D.A. planned watershed project to provide for flood control, water flow, and recreation.

Oakland, Maryland (1970 Population - 1,786)

Oakland is a gateway trade and service center for five state parks and a private ski resort. Visitors to these areas expand the local demand especially for retail goods and services. New second home development in the area is rapidly expanding so that seasonal residents will add to permanent resident needs as another increasing source of trade and service demand. The Youghiogheny River is supply source for the municipal water system supplying 5,000 persons. Dependable yield is sufficient for present use and projected demand. The Little Youghiogheny River receives untreated sewage from 5,000 persons. Required flow is sufficient for projected waste assimilation needs, providing a treatment facility is constructed.

Somerset, Pennsylvania (1970 Population - 6,269)

It offers urban functions to a surrounding region of farms, lumber mills and coal mines. Somerset is located at an interchange on Interstate 70 and benefits from supplying travelers' needs. It is a major gateway to several public and private recreation areas. Trade and service sectors will benefit as numbers of visitor recreation days increase. Interstate 70 is the east-west major access route. Multi-lane U.S. Route 219 provides access from the north and a less developed 219 provides access from the south. The Bureau of Public Roads estimates average daily traffic will increase 24 percent on north-south Appalachian Corridor N between 1975 and 1990. Laurel Hill Creek provides water supply for 8,000 persons. Emergency wells furnish additional supply during periods of insufficient flow. Coxes Creek receives secondary treated sewage from 6,000 persons. An insufficient flow of 13.5 cubic feet per second is foreseen for the year 2020. Lake Somerset, a non-Federal water impoundment, provides water supply reserves and is also used for fish and wildlife and improved flood control.

SUB-BASIN IV - West Fork

Location

The West Fork Sub-Basin covers 882 square miles of the southwest region of the Monongahela River Basin in northern West Virginia. It includes Harrison and Lewis Counties and a small portion of Marion, Taylor, Barbour and Upshur Counties. The dominant river flowing south to north through the region is the West Fork. Its major tributaries form the sub-basin: Upper West Fork, Elk Creek, Lower West Fork and Ten Mile Creek.

Population

The 1970 population of the area was 93,000. Average density is 105 persons per square mile. Population declined 9.3 percent in the 1960-1970 decade according to U.S. census figures for 1970. ARC projections based on 1960 census figures show a gradual population decline for the sub-basin to 1975. It is estimated that the population will be relatively stable.

West Fork Sub-Basin Projected Population, 1960-1985

Year	1960	1970	1975	1980	1985
Pop.	100,000	88,000	85,000	83,000	84,000

Source: ARC

Growth ratio for the West Fork Sub-Basin is .84, using 1960-1985 ARC figures.

Employment

Primary industries in the sub-basin make up 9.6 percent of total employment and are divided among forestry, agriculture and mining. Forestry provides a minimal proportion of employment. Agriculture, mostly beef cattle grazing, is declining. Mining, which includes gas, oil and coal, is dominated by coal extraction.

Secondary industries make up 29.9 percent of total employment. These include food, apparel, lumber, paper, printing and publishing, rubber goods, glass products, primary metals, fabricated metals, machinery, aircraft parts and miscellaneous manufacturing including morticians goods and toys. Glass products employ 58 percent of those engaged in secondary industries.

West Fork Sub-Basin IV
Industrial Structure

Industry	Employment
Agriculture and Forestry	24+D
Mining	2,209
Manufacturing	
Food	454
Apparel	D
Lumber	54
Paper	D
Printing and Publishing	155
Rubber Products	D
Stone, Clay, Glass	4,287
Primary Metal	D
Fabricated Metal	139
Machinery	264
Electrical Goods	D
Transportation Equipment	D
Toys	D
Miscellaneous	D
Transportation and Utilities	2,602
Trade	5,750
Finance, Insurance, Real Estate	819
Service	3,527
Construction	1,191

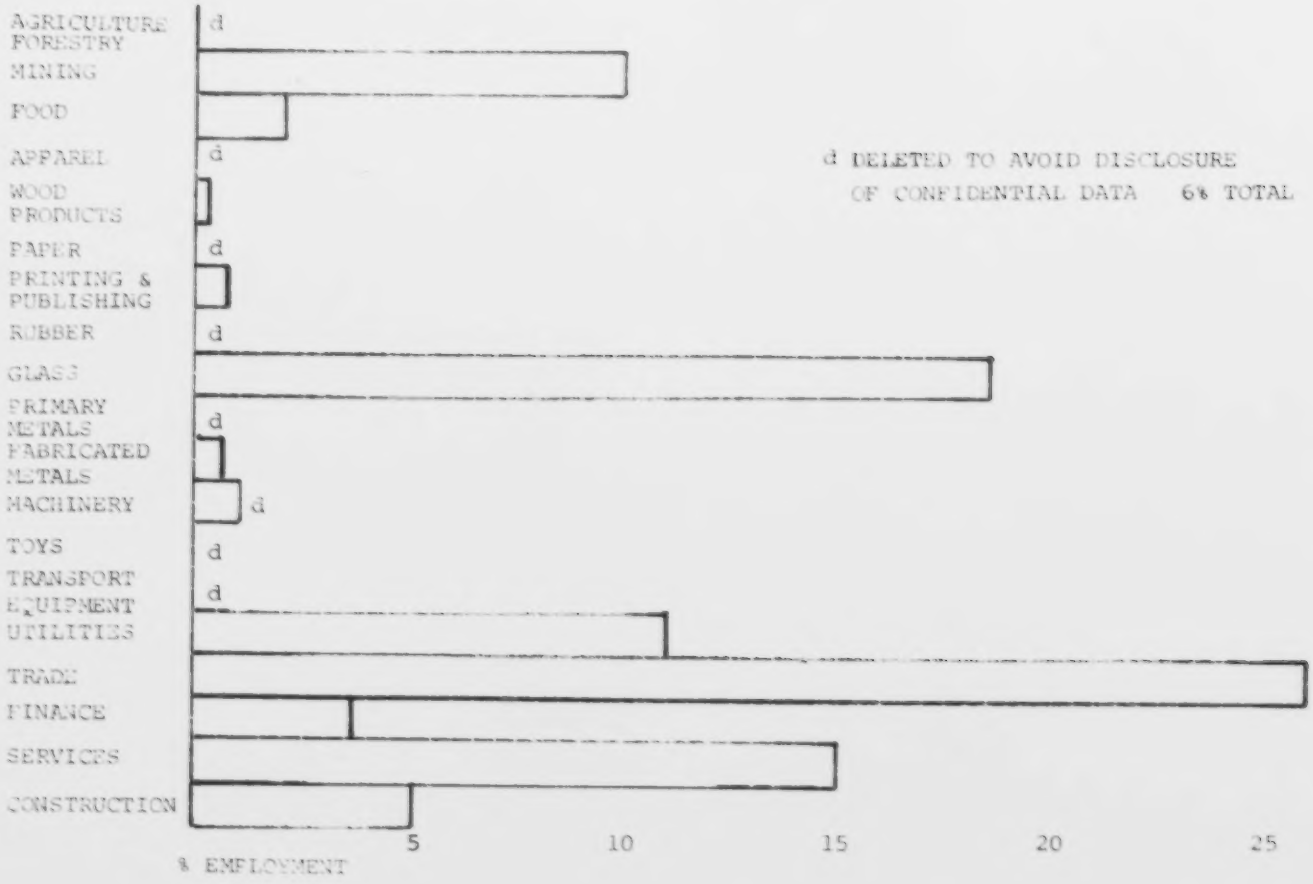
D = undisclosed

Source: County Business Patterns 1970

Tertiary industries employ 61.5 percent of total employment. Wholesale and retail trade is most important followed by services, transportation and utilities, construction and finance, insurance and real estate.

The current sub-basin unemployment rate is 4.9 percent.

West Fork Sub-Basin IV
Industrial Structure by
Employment
1970



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Industrial Earnings

Total industrial growth ratio for the West Fork Sub-Basin in earnings is 2.11 according to OBE projections. Most important sub-basin earnings, presently and throughout the intervening years until 1990, is glass manufacturing. Ranked second is mining followed by trade, services and construction. Although the food product industry ranks 6th in earnings in 1959, it drops to 7th place shortly after 1970. All machinery, currently ranking 8th, shows great growth potential and is expected to rank 6th in 1990. Agriculture and forestry have declined and are expected to continue declining. Wood products, printing and publishing, and fabricated metals will continue growth but maintain current earnings rankings 8, 9, 10 respectively.

WEST FORK SUB-BASIN IV
Industrial Growth In Earnings

In Thoulsands of 1967 Dollars

	1959	1962	1967	1968	1980	1990
Agriculture & Forestry	599	412	450	263	528	503
Mining	14,745	12,402	14,792	14,874	18,177	21,234
Manufacturing						
Food	629	591	597	642	777	924
Apparel & Textiles	D	D	D	D	D	D
Lumber & Furniture	178	162	246	252	452	644
Paper	D	D	D	D	D	D
Printing & Publishing	123	126	210	225	342	489
Stone, Clay, Glass	15,294	18,005	18,666	18,437	24,913	31,606
Primary Metal	D	D	D	D	D	D
Fabricated Metal	126	133	173	180	241	327
All Machinery	288	299	410	408	1,023	1,650
Transportation Equip.	D	D	D	D	D	D
Trade	5,301	5,260	6,204	6,342	10,682	15,171
Services	2,744	2,800	3,940	4,076	7,411	11,016
Construction	1,602	1,314	3,038	2,771	3,844	4,507

SOURCE: Office of Business Economics

D denotes figures withheld to avoid disclosure of operations of individual reporting units.

Per Capita Income

Income per capita 1959-1985 growth ratio is 2.79, highest of the six sub-basins. It ranked second in per capita income throughout the 1959-1985 period.

West Fork Sub-Basin Per Capita Income, 1959-1985 (1967 $)

Year	1959	1967	1970	1975	1980	1985
$	1,894	2,755	3,053	3,791	4,451	5,298

Source: ARC

Accessibility

West Fork Sub-Basin's highway improvements are currently in progress. The sub-basin is served at the present time by north-sough U.S. Highway 19 and two east-west routes. The northern U.S. Route 50 links the area with Washington, D.C. to the east and Cincinnati to the west through Clarksburg. U.S. Route 33 in the south links the sub-basin with Richmond to the east and Columbus to the west through Weston. Both Clarksburg and Weston are linked to Pittsburgh by U.S. 19. Four lane Interstate 79 now under construction will improve sub-basin passenger and commercial accessibility to the Pittsburgh area in the north and to Charleston in the wough. Appalachian Corridor D from the Cincinnati area will terminate at Clarksburg and serve the northern part of the sub-basin from the west. Appalachian Corridor H will link the southern part of the sub-basin to Interstate 66 and Washington, D.C. area in the east.

Benedum Airport provides commercial traffic to the West Fork Sub-Basin and will be updated by 1981 to gateway airport status. In addition a private sub-standard airport is located in Lewis County.

Railroad traffic in the region is now being studied to determine how the existing large trackage network can be used to better advantage.

Growth Centers

34.6 percent of the sub-basin's population lives in two major centers, Clarksburg and Weston. Both of these towns have been designated as growth centers. Manufacturing is dominated by glass products in both towns. Clarksburg's population declined 11.6 percent and Weston's population declined 16.3 percent between 1960 and 1970. According to ARC 1960-1985 projections based on 1960 census figures, Clarksburg and its primary trade area population will continue to decline. Weston and its primary trade population will show a slight increase.

Growth Center and Primary Trade Area Population Change 1960-1985

	1960	1969	1970	1975	1980	1985
Clarksburg	77,900	69,200	66,400	62,500	61,300	60,600
Weston	19,700	19,600	19,700	19,700	19,700	20,500

Source: ARC

ARC projections show Clarksburg and trade area 1960-1985 growth ratio as .78. Weston and trade area population growth ratio is 1.04.

Clarksburg (1970 Population - 24,864)

Clarksburg is the County Seat of Harrison County; its hinterland is made up of grazing lands, oil and gas fields and coal mines. The number of farms has declined dramatically in the past few years (54 percent for Harrison County in the 1960-64 period). This was accompanied by declines in total farm acreage and in agricultural employment. As mining has become less labor intensive and farm employment decreased, the demand for central place functions has decreased and Clarksburg's importance as a trade and service center has declined. However, with agricultural land now released for more diversified industrial development, enhanced by improving access to markets, Clarksburg's current economic and population decline may level off.

Clarksburg's accessibility will improve with the completion of Interstate 79 north-sough and Appalachian Corridor D east-west. Bureau of Public Roads 1966 figures project 1990 north-south traffic on the Clarksburg section of Interstate 79 to be 15,810 vehicles per day, an increase of 81 percent over the 1970 estimate. Corridor D projected 1990 traffic is estimated at 35,050 average daily vehicles, an increase of 41 percent over 1970 estimate. These figures are currently being updated and appear to be underestimated. Clarksburg trade and service industry should show some growth at this intersection in response to increased traffic. Air service at Benedum Airport outside of Clarksburg is a currently local service airport. However, passenger and cargo traffic should show increases when the airport is enlarged to become a gateway airport by 1981.

Federal Water Pollution Control Administration in its 1969 Development of Water Resources in Appalachia Appendix D has found Clarksburg provides water for a population of 39,938 from the West Fork River. This demand is 4.9 million gallons daily. Reliable yield from the West Fork River is 1.6 million gallons daily. This possible deficit is covered by impoundments with 300 million gallon capacity. These impoundments will provide for the projected 11.2 million gallons daily required in the year 2020. Clarksburg's municipal sewer system currently serves 32,000 persons. Although a treatment plant is now under construction, raw sewage has been dumped into the West Fork River. The current reliable water flow at the dumping points is 5.6 cubic

feet per second. Required flow to handle estimated 2020 demands for waste assimilation will be 100 cubic feet per second, a possible 94.4 CFS deficit. The new treatment plant should decrease the projected assimilation demand.

Weston (1970 Population - 7,323)

Weston is also a trade and service center for a declining agricultural area. It is the County Seat of Lewis County. Glass products dominate its manufacturing sector. Future outlook for Weston is favorable, however, as a gateway to the proposed recreation area created by the Corps of Engineers' authorized reservoir, Stonewall Jackson Lake. Trade and service industry employment and income should increase in response to tourist demand.

Weston is the western terminal of proposed Appalachian Corridor H, a four lane extension of Interstate 66. At Weston, Corridor H intersects with proposed four lane north-south Interstate 79. 1966 Bureau of Public Roads traffic projection estimates north-south 1990 average daily traffic through the Weston section at 16,540 vehicles, an increase from 1970 ADT of 119 percent. Projections now being updated show 1966 estimates low. 1990 BPR projections, now being updated, show east-west average daily traffic on Corridor H as 11,500 vehicles, a 38 percent increase over 1970 average daily traffic. Weston, located at the intersection of Interstate 79 and the terminus of Corridor H, should realize some trade and service growth generated by the traffic increase.

The West Fork River is the source of water supply for 7,000 persons residing in the Weston area. The dependable yield from this stream is .05 million gallons daily. Projected demand for 2020 is 1.0 million gallons daily. The West Fork River receives treated sewage from 8,300 persons in the Weston service area. Treatment includes both secondary and clorination processes. Reliable flow of the West Fork is presently .14 cubic feet per second. Year 2020 projected required flow for assimilation is 14 cubic feet per second. 2020 demands will be met by Stonewall Jackson Reservoir scheduled for completion by 1980.

SUB-BASIN V - Tygart

Location

The Tygart Sub-Basin covers 1,370 square miles in the south central Mononghaela River Basin in northern West Virginia. It includes major portions of Taylor, Barbour, Upshur and Randolph Counties and minor portions of Preston, Monongalia, and Marion Counties. The most important river in the sub-basin is the Tygart Valley River which flows south to north, through the region. Six minor sub-basins are: the Lower Tygart, Middle Tygart, Buckhannon River, Middle Fork River, Upper Tygart, Leading Creek.

Population

The 1970 population of the area was 64,000. Average density is 47 persons per square mile. The population declined 6 percent between 1960 and 1970. ARC figures using 1960 as a base year show a gradual population decline until 1980. Population between 1980 and 1985 is expected to remain stable.

Tygart Sub-Basin Projected Population 1960-1985

Year	1960	1970	1975	1980	1985
Pop.	69,000	64,000	62,000	60,000	58,000

Source: ARC

Growth ratio for the Tygart Sub-Basin is .85.

Employment

Primary industries in the Tygart Sub-Basin include agriculture and forestry, which is of greater importance than in most sub-basins in the Monongahela River Basin. Mining, however, dominates the primary sector with coal extraction most important. Associated with the forestry industry is the manufacture of lumber and furniture, the leading secondary industry. Tertiary activities employ the greatest numbers in the sub-basin. Trade ranks as most important. This is followed closely by service industries, as three small colleges are located in growth centers of the region. The current unemployment rate is 7.6.

Industrial Earnings

Total sub-basin industrial growth ratio for the period 1959-1990 is 2.30 according to OBE earnings projections based on 1967 dollars. Figures indicate that mining may continue as the industry with leading earnings, followed by lumber and furniture, trade, and service. Construction and food products will be is less importance. Growth figures are unavailable for agriculture and forestry, apparel, paper, printing and publishing, primary metals, and transportation equipment, all of which have some importance within the sub-basin.

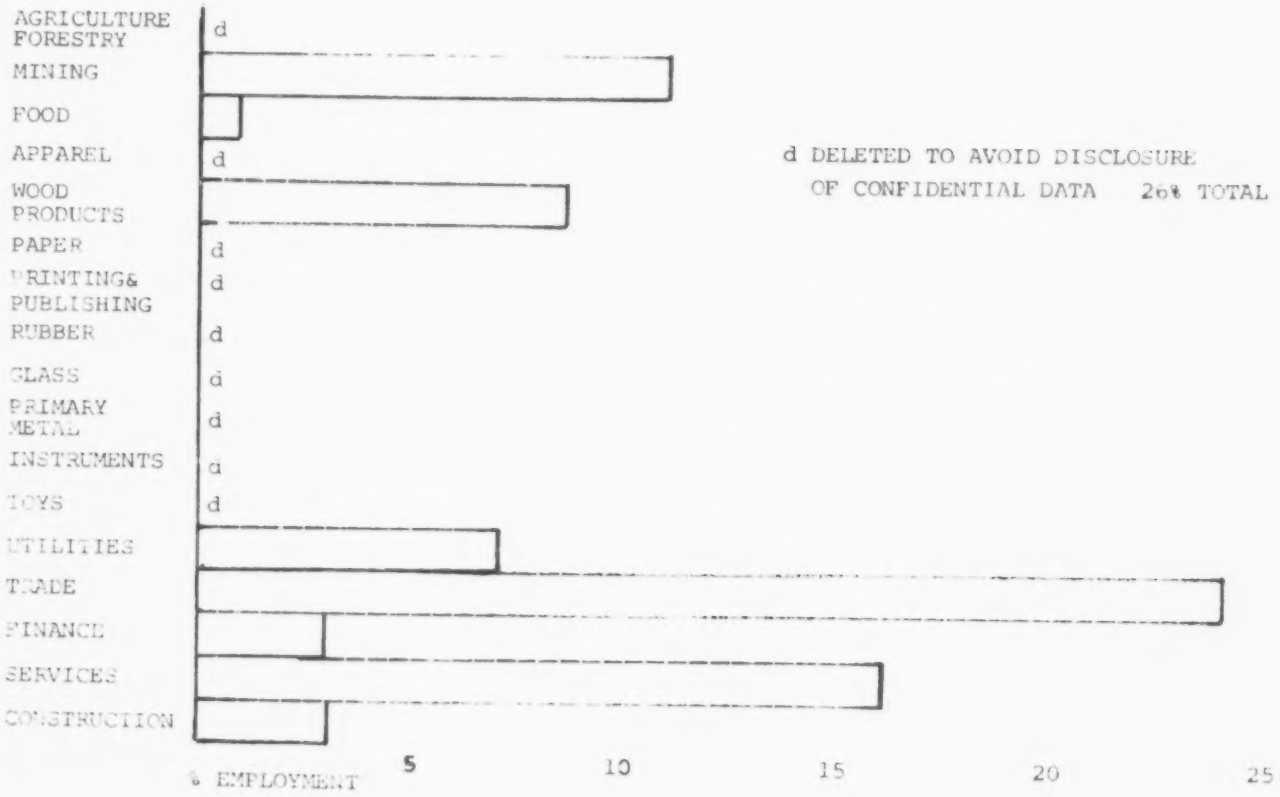
Per Capita Income

Tygart Sub-Basin Per Capita Income, 1959-1985 (1967 $)

Year	1959	1967	1970	1975	1980	1985	Growth Ratio
$	1,303	1,816	2,026	2,474	2,963	3,540	2.72

Source: ARC

Tygart Sub-Basin V
Industrial Structure by
Employment
1970



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OF CONFIDENTIAL DATA 26% TOTAL

TYGART SUB-BASIN V
Industrial Growth In Earnings

1959-1990 in 1,000's of 1967 $

	1959	1962	1967	1968	1980	1990
Agriculture & Forestry	D	D	D	D	D	D
Mining	7,373	6,201	7,396	7,437	8,952	10,617
Manufacturing						
Food	105	98	99	106	129	154
Apparel	D	D	D	D	D	D
Furniture & Lumber	2,148	1,956	2,973	3,027	5,441	7,728
Paper	D	D	D	D	D	D
Printing	D	D	D	D	D	D
Primary Metal	D	D	D	D	D	D
Transportation Equip.	D	D	D	D	D	D
Trade	2,120	2,104	2,480	2,536	4,272	6,068
Services	1,372	1,400	1,970	2,030	3,704	5,508
Construction	320	262	607	554	768	901

SOURCE: Office of Business Economics

D denotes figures withheld to avoid disclosure of operations of individual reporting units.

TYGART SUB-BASIN V
Industrial Structure

Industry	Employment
Agriculture and forestry	D
Mining	1,042+D
Manufacturing	
Food	82
Apparel	D
Lumber and furniture	820
Paper	D
Printing and publishing	D
Rubber products	D
Stone, clay, glass	D
Primary metal	D
Instruments	D
Toys	D
Transportation and utilities	699
Trade	2,223
Finance, insurance, real estate	313
Services	1,468
Construction	300

D = undisclosed

SOURCE: County Business Patterns 1970

Tygart Sub-Basin income per capita growth is estimated to steadily increase. Although its rank is fifth, relative to the other Monongahela Sub-Basins, its growth ratio ranks second at 2.72.

Accessibility

Tygart accesibility will be improved by the completion of east-west Appalachian Corridor H. This highway will be four lanes and will carry nearly 10,000 cars daily as projected by 1966 Bureau of Public Roads estimates. These estimates are currently being updated as 1966 figures have proved low. The sub-basin will then be easily accessible to the Washington, D.C. area in the east and north-south Interstate 79 which bypasses the sub-basin a few miles west. Current north-sough traffic must use U.S. Routes 119 and 250 and east-west traffic, U.S. Route 33.

Air transportation within the sub-basin is limited to a local service airport at Elkins, Randolph County and a substandard privately owned airport in Upshur County.

Rail trackage is being studied for more efficient use.

Growth Centers

39 percent of the 1970 Tygart Sub-Basin population lives in the growth centers - Buckhannon, Elkins, Grafton and Philippi. These growth centers have increased 10 percent in population over the last decade according to 1970 census figures. Each of the centers functions as a central place for its surrounding hinterland. In addition, Buckhannon, Elkins, and Philippi are education centers.

Buckhannon showed a 13.7 percent population increase in the 1960-1970 decade; Elkins decreased .2 percent; Grafton grew 11.1 percent; and Philippi grew 34.7 percent. ARC projections based on 1960 populations for the centers and trade areas show a general decline. Since trade area includes much more than the center itself, it is possible for the center to show growth and its hinterland to show a sharp decline. This is especially true in these cases of growing university towns in rural areas when the rural populations all over the U.S. are rapidly declining.

Growth Center and Primary Trade Area Population Change, 1960-1985

Year	1960	1967	1970	1975	1980	1985	Growth Ratio
Buckhannon	15,900	17,100	16,700	16,600	16,300	16,200	1.0
Elkins	17,300	16,500	16,700	16,500	16,400	16,500	.95
Grafton	15,000	14,800	14,200	13,200	12,300	11,400	.76
Philippi	10,100	8,200	8,000	7,800	7,700	7,600	.75

Source: ARC

Buckhannon (1970 Population - 7,261)

Buckhannon is the County Seat of Upshur County and County level government employment contributes to the economy. West Virginia Wesleyan College attracts 1,750 students. Their goods and services are provided by the city. Audra State Park attracts outside visitors as well as local citizens to its 355 acre recreation facilities. Buckhannon accessibility is now limited to north-south U.S. Route 119 and east-west U.S. Route 33. Four lane Corridor H, now under construction, should aid accessibility to the east and to Interstate 79 to the west. Traffic over this completed corridor is estimated by the BPR to increase 38 percent between 1975-1990.

In 1960 Buckhannon River provided source of supply for 7,350 persons served by Buckhannon municipal water system. The safe yield based on the 30 years low is 0.15 million gallons daily. Present use if 0.7 million gallons daily with a projected year 2020 demand of 2.5 million gallons daily. A reservoir on the Buckhannon River proposed by the Corps of Engineers would not only cover the present and projected possible water deficit but would also provide for flood control. Sewage treated by secondary and chlorination processes is received by the Buckhannon River for 4,450 persons - a portion of the total residents. Low flow at receiving points if 1.6 cubic feet per second. Projected required flow for waste assimilation in year 2020 will be 14 cubic feet per second. The reservoir for reliable flow and more extensive sewer services will be needed in the future.

Elkins (1970 Population - 3,257)

Elkins is the County Seat of Randolph County. It offers urban functions to a coal and timber region and Davis and Elkins College, with 870 students.

Elkins is a railroad terminus. It is linked with the east and west by U.S. Route 33 and north and south by Route 219. Appalachian Corridor H will serve Elkins with four lanes to provide for the projected 1975-1990 average daily traffic increase of 38 percent. Elkins is also served by a local service airport.

Elkins supplies water to 9,500 persons using the Tygart Valley River as a source of supply. The safe yield based on the 30 year low is 0.6 million gallons daily. Presently 1.3 million gallons are used daily and year 2020 requirement is estimated at 1.8 million gallons daily. The Tygart Valley River serves as receiving stream for secondary and chlorinated sewage for 8,135 persons - a portion of those supplied with water. Low flow in the Tygart is 1.7 cubic feet per second, a possible 12.3 cubic feet per second flow deficit for the projected demand in year 2020. A reservoir planned by the Corps of Engineers would not only ensure supplies for municipal water and waste assimilation, but also provide for flood control. This reservoir would also provide protection for the 13,000 acre flood plain adjacent to the city, an excellent area for industrial development.

Grafton (1970 Population - 6,433)

Grafton is the County Seat of Taylor County. Its location at the intersection of two highways provides some trade and service activity. Grafton's growth is physically limited by the surrounding topography. A glass factory, one of its major sources of employment, was recently closed.

Grafton will be bypassed by Appalachian Corridor routes and Interstate 79. It will continue to be served by U.S. Route 50 east-west and U.S. Route 119 north-south.

Grafton provides water to 10,000 persons from the Tygart Valley River. The reliable yield is 70 million gallons adequately providing for both present use of 2 million gallons daily and any future needs. Sewage with no treatment is discharged into the Tygart Valley River for 7,430 persons. Low flow at the receiving point is 170 cubic feet per second which some feel is adequate for assimilation of current Grafton sewage quantities.

Philippi (1970 Population - 3,002)

Philippi is the County Seat of Barbour County. It provides central place functions and is the location of Alderson-Broaddus College with 1,000 students.

Philippi will be bypassed by the new Appalachian highway corridors but will continue to be served by north-sough U.S. Routes 119 and 250. Philippi water supply for 2,700 persons comes from the Tygart Valley River. The safe field is sufficient for current and projected demand. The Tygart also receives primary and clorine treated sewage for 2,800 persons. The reliable flow of 8.9 cubic feet per second is insufficient for projected year 2020 assimilation needs. The Corps of Engineers plans reservoirs on the Middle Fork River and the Upper Tygart Valley River to meet future water needs and provide flood control.

SUB-BASIN VI - Cheat

Location

The Cheat Sub-Basin covers 1,422 square miles in the southeastern portion of the Monongahela River Basin in West Virginia and Pennsylvania. It covers most of Preston and Tucker Counties in West Virginia and portions of Randolph and Monongalia Counties. The northern tip is located in Fayette County, Pennsylvania. The Cheat Sub-Basin is made up of five minor sub-basins: Lower Cheat River, Big Sandy Creek, Upper Cheat River, Shavers Fork and the Blackwater River. The major river flowing south to north through the region is the Cheat.

Population

1970 population in the Cheat Sub-Basin was 35,000 persons. During the 1960-1970 decade, population declined 8.6 percent. In 1970 density was 25 persons per square mile. ARC projections estimate a slight population increase between 1960 and 1985 based on 1960 figures.

Cheat Sub-Basin Projected Population, 1960-1985

Year	1960	1970	1975	1980	1985
Pop.	38,000	42,000	41,000	41,000	42,000

Source: ARC

Growth ratio for the area is 1.1

Actual Cheat Sub-Basin 1970 population by census count was 7,000 persons less than the 1970 estimates by ARC based on 1960 census figures. The projected 1985 increases estimated by ARC are undoubtedly affected by this discrepancy.

Employment

Primary industries in the Cheat Sub-Basin make up 12 percent of disclosed employment. Agriculture and forestry are of some importance, but the dominant primary industry is mining, principally coal. In January, 1972 a new reserve of natural gas was discovered in Tucker County. Test wells indicate that this reserve is one of the largest in this part of the country. Some primary employment will be derived as this reserve is developed, and service industries such as pipe line construction should also benefit from this recent discovery. Secondary industries make up 35 percent of disclosed employment. Wood products dominate all manufacturing. Also providing secondary industry employment are food products, apparel and textiles, wood based chemicals, leather, primary metals, and instruments.

Trade and service activities dominate tertiary industry employment. 53 percent of disclosed employment is engaged in tertiary industries. Also important are utilities construction and finance, insurance and real estate.

Total employment in Sub-Basin VI is 5,124 persons. The 1971 unemployment rate is 9.7. Tucker County has the highest 1971 unemployment rate in the Monongahela River Basin at 16 percent. Most important industries by numbers employed are trade, service, and wood products.

Industrial Earnings

Growth in earnings, as estimated by Office of Business Economics, is and will continue to be lead by mining and wood products through 1985. Trade, service, and construction will also show continued growth.

Per Capita Income

Sub-Basin income per capita is lowest among the six sub-basins. Its rate of growth ranks fourth.

Cheat Sub-Basin Per Capita Income, 1959-1985 (1967 $)

Year	1959	1967	1970	1975	1980	1985
$	1,312	1,645	1,825	2,187	2,695	3,087

Growth ratio for the 1959-1985 period is 2.35

Cheat Sub-Basin VI
Industrial Structure

Industry	Employment
Agriculture	D
Mining	543+D
Manufacturing	
Food	
Apparel and Textiles	41
Lumber	D
Chemicals	643
Leather	D
Primary Metal	D
Instruments	D
Transportation and Utilities	498
Trade	1,227+D
Finance, Insurance, Real Estate	91+D
Services	723
Construction	155

Source: County Business Patterns 1970 D = undisclosed

CHEAT SUB-BASIN VI
Industrial Growth in Earnings

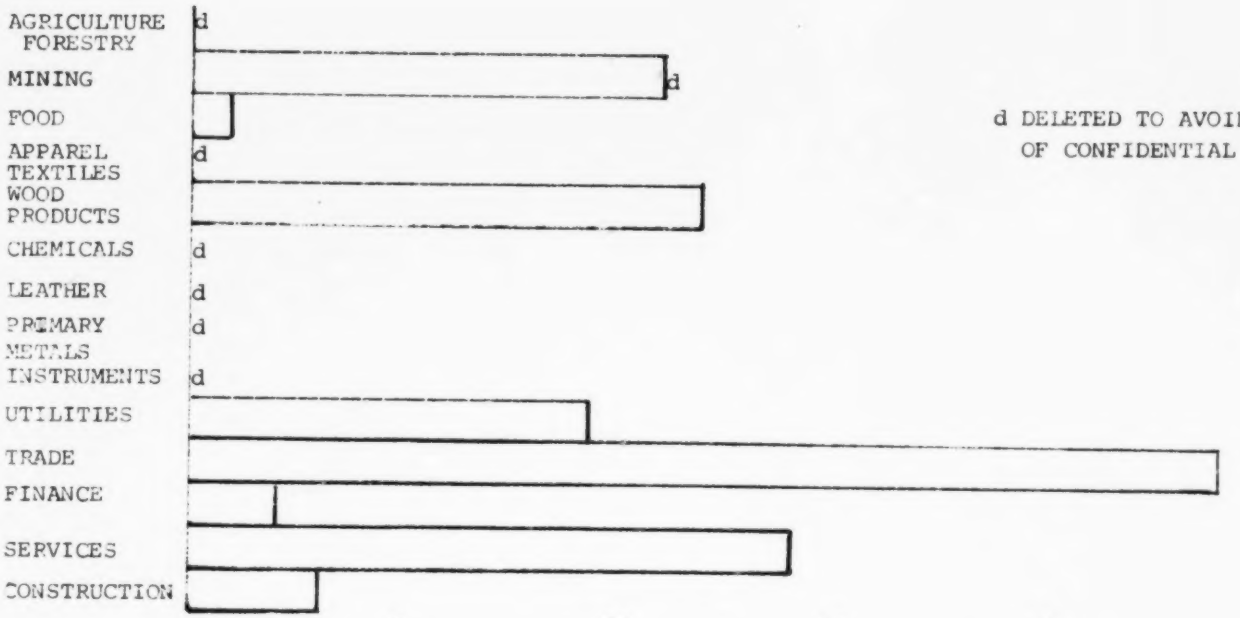
1959-1990 in 1,000's of 1967$

	1959	1962	1967	1968	1980	1990
Agriculture	D	D	D	D	D	D
Mining	3,686	3,100	3,698	3,718	4,544	5,308
Manufacturing						
Food	52	49	50	53	65	77
Apparel	D	D	D	D	D	D
Lumber & Furniture	1,700	1,549	2,354	2,396	4,308	6,119
Chemicals	D	D	D	D	D	D
Primary Metal	D	D	D	D	D	D
Trade	1,060	1,052	1,240	1,268	2,136	3,034
Service	617	630	887	917	1,667	2,478
Construction	192	157	356	333	461	541

SOURCE: Office of Business Economics

D denotes figures withheld to avoid disclosure of operations of individual reporting units.

Cheat Sub-Basin VI
Industrial Structure by
Employment
1970



d DELETED TO AVOID DISCLOSURE
OF CONFIDENTIAL DATA 23%TOTAL

SOURCE: COUNTY BUSINESS PATTERNS
1970

Recreation

58 percent of the area of Cheat Sub-Basin, or approximately 824 square miles, lies within the Monongahela National Forest. This large national investment limits the area and type of development for most of the region. Recreation oriented activities are, however, enhanced by the presence of the national forest. Emphasis has been placed on more preservation and enjoyment of natural features in the region rather than development and promotion of recreation facilities as in the Youghiogheny Sub-Basin. Of the 19 recreation areas located within the sub-basin, 18 are publicly owned, and privately owned Lake Lynn's primary function is power production. Of the six proposed recreation areas, three are to be developed partially by private investments. The other proposed recreation areas will be Federally funded.

ARC estimates an increase in recreation visitor activity days in the region from 5,819,000 in 1970 to 8,179,000 in 1985. Trade and service functions should show a positive response to this increase in recreation visitors.

Accessibility

The Cheat Sub-Basin is currently accessible north-south by U.S. Route 219 and east-west by U.S. Routes 33, 50, 250. Appalachian Corridors E and H will provide improved accessibility to the northern and southern recreation areas.

Growth Centers

Kingwood is the growth center for the region. Its 1970 population was 2,550, an increase of 8 percent in the last decade. Benefits from the recreation growth in the south will not be reflected in Kingwood because of its northern location. Lack of accessibility to both far north and southern recreation development areas will not be improved as Kingwood is bypassed by U.S. Routes and proposed Appalachian Corridors. Kingwood municipal sewer system serves 2,000 persons. Untreated sewage is received by the Cheat River. An application has been filed for Federal aid for a waste treatment plant.

APPENDIX B - Monongahela River Basin Water Resource Investments 1/

In the Greater Pittsburgh Sub-Basin, the U.S. Department of Agriculture plans watershed projects on Jacobs and Sewickley Creeks. Both plans include flood control projects as well as providing for recreation on Jacobs Creek and water supply on Sewickley Creek. A locally sponsored protection project has been completed on Turtle Creek. (Map numbers 25, 26, 49)

In the Monongahela Sub-Basin the Corps of Engineers plans a reservoir on Dunkard Creek which would not only help insure summer flow in the lower Monongahela, but also would provide flood control for undeveloped acres of unprotected flood plain for development in the lower Monongahela growth area. Ten Mile Creek Reservoir will be needed for flood protection and water supply for Waynesburg urban expansion. The U.S.D.A. has completed watershed projects on Dunlap Creek in Fayette County for flood control and fish and wildlife, and Wheeling Creek in Greene County for flood control and recreation.

Watershed projects planned by the U.S.D.A. are flood control and fish and wildlife areas on Upper Deckers Creek in Monongalia County and flood control and recreation improvements on Prickett Creek in Marion County. Several locally sponsored projects have been completed: Ryerson Station Reservoir in Greene County is used for water storage, recreation, and fish and wildlife. Channel and levee improvements have been made on Pike Run and Dunlap Creek. (Map numbers 5, 22, 23, 20, 37, 48, 50, 51)

In the Youghiogheny Sub-Basin the Corps of Engineers' major project is the Youghiogheny Reservoir for flood control and to augment the lower Youghiogheny and Monongahela during periods of low flow, as well as a recreation site. The Corps has also made river improvements near Friendsville, Maryland. Further improvements on the Youghiogheny River are planned for flood control, water storage, and recreation. Planned Laurel Hill Creek Reservoir would open undeveloped flood plain for industrial development in the lower Monongahela Basin and would increase summer flows. The Upper Youghiogheny proposed reservoir would assure flow in the Youghiogheny River under consideration by the Bureau of Outdoor Recreation as a Wild and Scenic River.

1/ Information on water resource investments has been obtained from Development of Water Resources in Appalachia, Main Report, Part II, Corps of Engineers, and Appendix A, U.S.D.A.

Recreation at Youghiogheny Reservoir would be enhanced by stable water levels while downstream flows are maintained. Laurel Hill Creek and Upper Casselman Reservoirs would alleviate flood problems and provide reserve water supplies for growth centers, Connelsville and Myersdale, as well as other small communities. Ohiopyle Recreation Area would also be made more attractive by water quality and flow improvements. The U.S.D.A. also plans a watershed project on the Upper Casselman for flood control, water supply, recreation and fish and wildlife areas. A planned flood control, water supply and recreation project is also scheduled for Wills Creeks. A non-federal water impoundment investment is located in Garrett County, Maryland. Deep Creek Lake provides 3,900 acres for power and recreation. Lake Somerset in Somerset County, Pennsylvania, a locally sponsored project, is used for water storage, recreation, and a fish and wildlife area.

The towns of Boynton, Confluence, and Rockwood have completed flood protection projects in Somerset County. (Map numbers 1, 7, 8, 9, 24, 27, 35)

The West Fork Sub-Basin is the location of the new authorized Corps of Engineers reservoir, Stonewall Jackson Lake in Lewis County. This multi-use reservoir should be completed by 1980. Planned reservoirs on Hackers Creek, Elk Creek and Ten Mile Creek would resolve water supply, water quality, and flood problems foreseen with growth of Fairmont and Clarksburg and adjacent communities. The U.S.D.A. has completed watershed flood control projects on the Salem Fork of Ten Mile Creek in Harrison County and Polk Creek in Lewis County. Watershed projects are planned on Elk Creek and Simpson Creek in Barbour County for flood control, recreation, and water supply, and on Limestone Run in Harrison County for flood control and recreation. The City of Weston has completed channel and levee projects on Polk and Stonecoal Creeks. Wyatt on Binganon Creek has completed a similar project. Harrison County has completed flood control projects on Elk Creek. (Map numbers 3, 12, 13, 14, 18, 19, 30, 31, 33, 41, 42, 44)

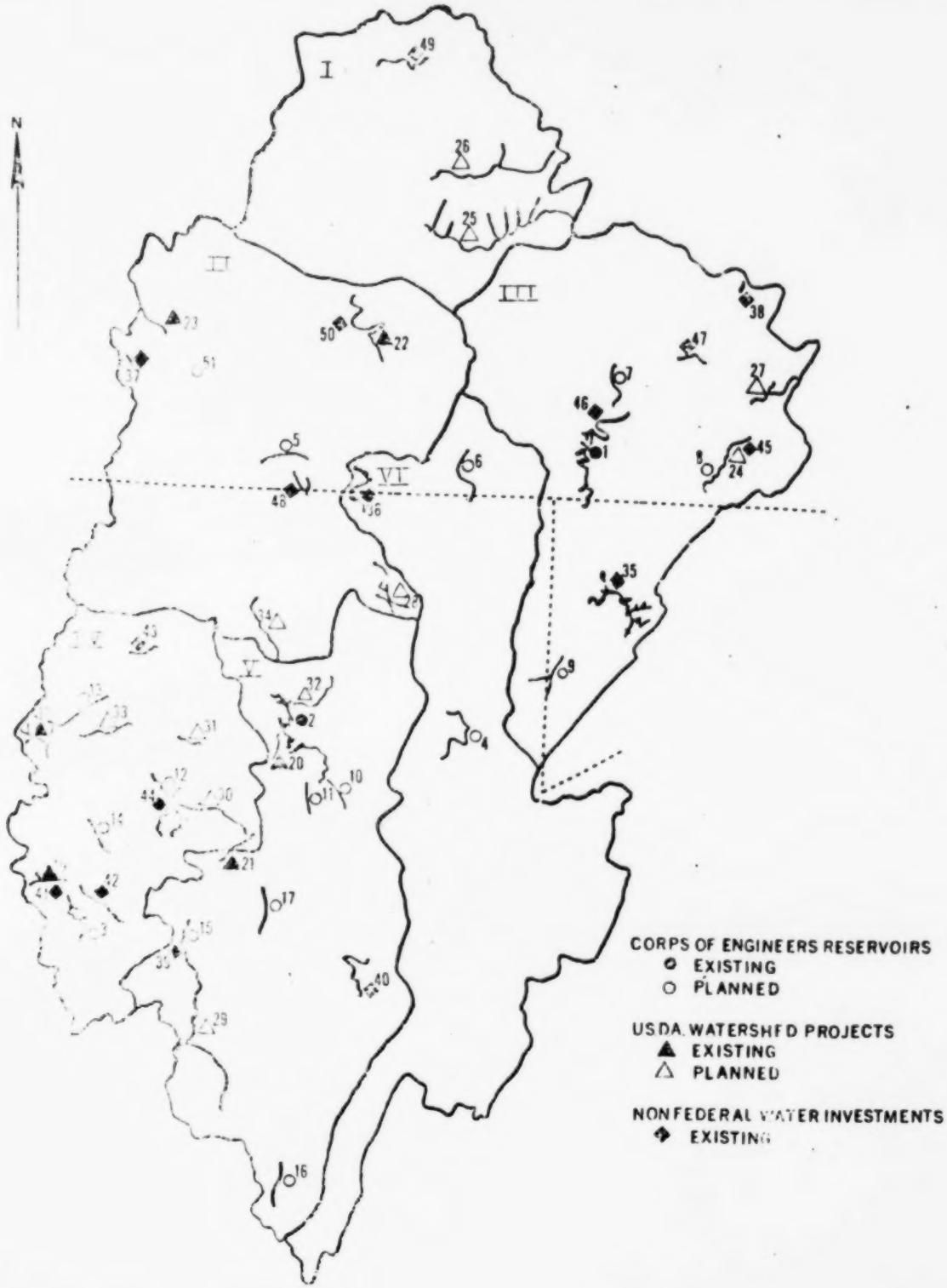
The Tygart Sub-Basin is the location of the Corps of Engineers' major investment, Tygart Lake. It provides flood control protection, navigation levels, and recreation. Although restrictive topography precludes extensive development of the growth center, Grafton, two new reservoirs have been proposed nearby. Teter Creek and Laurel Creek reservoirs are planned to compensate for the excessive mid-summer downdraw - of Tygart Lake. Because Tygart Lake is operated to augment low flow to insure navigation on the Monongahela River, its multiple use as a recreation site diminishes in the summer period of prime demand. Mud banks exposed by the downdraw seriously impair the use and attractiveness of the lake. The Teter and Laurel impoundments will maintain water levels in Tygart Lake or could be developed as

alternate summer recreation areas. Planned reservoirs on the Upper Tygart, Middle Fork and Buckhannon Rivers are to provide water supply and flood control for the growth centers, Buckhannon and Philippi. The Upper Tygart reservoir will also provide for flood protection, water supply and water quality for the potential growth needs of Elkins. A 13,000 acre easily protected flood plain is available adjacent to Elkins for light industry development. U.S.D.A. watershed projects completed in Barbour County were on Shooks Run and Pekks Run for flood protection. Planned watershed projects will be completed for flood control and recreation on Three Forks Creek and the Upper Buckhannon Rivers. Local protection projects have been completed by the town of Buckhannon on the Buckhannon River and the town of Elkins on the Tygart Valley River. (Map numbers 2, 10, 11, 15, 16, 17, 20, 21, 29, 32, 40)

In the Cheat Sub-Basin the Corps of Engineers plans two reservoirs. Rowelsburg multi-use reservoir has been authorized for completion in 1980. Big Sandy Creek Reservoir will reduce flood damage, increase summer flows and open unprotected flood plain for development in the lower Monongahela growth area. Lake Lynn is a non-federal water impoundment for a power source. (Map numbers 4, 6, 36)

Figure 5

MONONGAHELA RIVER BASIN
WATER RESOURCE INVESTMENTS



MONONGAHELA RIVER BASIN
WATER RESOURCE INVESTMENTS

LOCATION	USE							
	Flood Control	Water Supply	Water Quality	Power	Navigation	Recreation	Fish and Wildlife	Low Flow Augmentation
Corps of Engineers Reservoirs								
Existing:								
1. Youghiogheny Reservoir	x					x		x
2. Tygart Lake	x				x	x		
Planned:								
3. Stonewall Jackson Lake	x	x	x			x		
4. Rowlesburg Reservoir	x	x	x			x		
5. Dunkard Creek Reservoir	x	x	x					
6. Big Sandy Creek Reservoir	x					x		x
7. Laurel Hill Creek Reservoir	x	x	x					
8. Upper Casselman River Reservoir	x	x	x					
9. Upper Youghiogheny River Reservoir						x		x
10. Teter Creek Reservoir						x		x
11. Laurel Creek Reservoir						x		x
12. Elk Creek Reservoir	x	x	x					
13. Ten Mile Creek Reservoir	x	x	x			x		
14. Hackers Creek Reservoir	x	x	x					
15. Buckhannon River Reservoir	x	x						
16. Upper Tygart Reservoir	x	x						
17. Middle Fork River Reservoir	x	x						
51. Ten Mile Reservoir	x	x						
USDA Watershed Projects								
Existing:								
18. Salem Fork-Ten Mile Creek	x							
19. Polk Creek	x							
20. Shooks Run	x							
21. Pecks Creek	x							
22. Dunlap Creek	x						x	
23. Wheeling Creek	x					x		
Planned:								
24. Upper Casselman	x	x				x	x	
25. Jacobs Creek	x					x		

MONONGAHELA RIVER BASIN
WATER RESOURCES INVESTMENTS
(Cont'd)

LOCATION	USE							
	Flood Control	Water Supply	Water Quality	Power	Navigation	Recreation	Fish and Wildlife	Low Flow Augmentation
26. Sewickley Creek	x	x						
27. Wills Creek	x	x				x		
28. Upper Deckers Creek	x						x	
29. Upper Buckhannon	x					x		
30. Elk Creek	x	x				x		
31. Simpson Creek	x	x				x		
32. 3 Forks Creek	x					x		
33. Limestone Run	x					x		
34. Prickett Creek	x					x		
Non Federal Water Investments								
35. Deep Creek Lake				x		x		
36. Lake Lynn				x				
37. Ryerson Station		x				x	x	
38. Lake Somerset		x				x	x	
39. Buckhannon River	x							
40. Tygart River	x							
41. Polk Creek	x							
42. Stone Coal Creek	x							
43. Bingamon Creek	x							
44. Elk Creek	x							
45. Boynton	x							
46. Confluence	x							
47. Rockwood	x							
48. Pike Run	x							
49. Turtle Creek	x							
50. Dunlap Creek	x							

APPENDIX C - Appalachian Regional Development Program Investment, Total Project Costs Through February 11, 1972, Monongahela River Basin, by County (Excluding Appalachian Development Highways)

Garrett, Maryland	$ 6,181,472
Allegheny, Pennsylvania	1,062,000
Fayette, Pennsylvania	9,386,548
Greene, Pennsylvania	3,204,262
Somerset, Pennsylvania	8,823,544
Washington, Pennsylvania	8,306,850
Westmoreland, Pennsylvania	13,705,155
Barbour, West Virginia	2,836,709
Harrison, West Virginia	8,182,929
Lewis, West Virginia	-
Marion, West Virginia	11,647,153
Monongalia, West Virginia	3,407,003
Pocahontas, West Virginia	750,000
Preston, West Virginia	1,679,950
Randolph, West Virginia	3,355,008
Taylor, West Virginia	4,442,844
Tucker, West Virginia	3,098,869
Upshur, West Virginia	5,842,755

Source: Appalachian Regional Commission, computer printout. (May need checking before use in the effort index.)

APPENDIX D - State Laws Pertaining to Environmental Protection

This Appendix will review the state laws in Maryland, Pennsylvania and West Virginia which have been enacted to regulate pollution in the air, waters and lands of those states. The laws reviewed in this Appendix will include those controlling water pollution, acid mine drainage, solid waste disposal, air pollution, and surface mining. Each of these three states has a broad range of legislative powers which enables them to take enforcement action and to develop pollution abatement programs that can be undertaken by the states or their municipalities. While there are many similarities among the state laws, each state has approached its various environmental problems with different techniques and legal authority.

MARYLAND

Maryland Water Resources Law

The water resources law of Maryland sets forth the policy of the state as it relates to the preservation and conservation of water resourses. This policy is primarily directed toward the use of state waters for power plants and reservoirs. It sets forth procedures for obtaining permits and provides for enforcement of the water policy. The Water resourse law also provides for the regulation of water quality and provides enforcement procedures and penalties for individuals communities and industries who pollute the waters of Maryland. The water resources law assigned to the Department of Water Resources the primary responsibility for drafting and enforcing water quality standards and effluent standards and for generally administering the water resources law of the state. The law also provides that the Department shall to the extent possible and feasible cooperate with federal and local governments

to develop a long-range water resource program and coordinate state and federal water resource policies. Authority to participate in river basin compacts and water authorities is also derived from this law. The legislature in Maryland recently passed authority to abate acid mine drainage from abandoned mines. This authority created a fund in the amount of $5 million which shall be used exclusively for prevention of drainage from abandoned mines. It also gives the Department of Natural Resources authority to acquire and rehabilitate land occupied by deep or drift mines so that land does not contribute to water pollution.

Maryland Environmental Service Law

The Maryland Environmental Service is a body politic and corporate created by the environmental service law to provide the state of Maryland and its local governments with waste purification and disposal services for air, land and water pollution. This Agency has been vested with the authority to plan, carry out research and development and operate waste management programs throughout the state. The law requires that close coordination be carried out with the Secretary of Health and Mental Hygiene and that the Secretary of Natural Resources develop a policy regarding the selection of pollution abatement projects undertaken by the Service. In order to fund the services and activities carried out by the Maryland Environmental Service, the Service is authorized to issue bonds. To the extent possible, these bonds shall be revenue bonds supported by fees charged for the delivery of pollution control services throughout the state. The environmental service law requires that waste water purification and solid waste disposal regions be established throughout the state that five-year plans for carrying out abatement programs in these two fields be developed. The Environmental

Service may contract with municipalities to operate waste disposal projects or they may acquire such projects from municipalities and other local governments that are presently operating them.

Air Quality Control Law

The responsibility for enforcing the air pollution laws in Maryland is vested with the State Department of Health and Mental Hygiene. The state is required to establish air quality areas throughout the state and set standards, rules and regulations for controlling emissions into the air. The State Health Department has full responsibility for inspections, enforcement of the laws and assignment of violations and penalties.

Solid Waste Management Law

The health laws of Maryland provide that each county shall submit to the State Department of Health and Mental Hygiene a preliminary plan for solid waste management on or before December 31, 1971. By June 30, 1972, the first of three progress reports shall be submitted to the Department of Health outlining the progress that has been made toward the completion of a final county solid waste plan. The final progress report should be submitted along with the complete and final draft of the solid waste management plan to be submitted to the Department by June 30, 1973. Based on the plans developed by the counties, the Maryland Environmental Service and the Department of Health may enter into contracts with the various local governments to develop solid waste disposal systems in accordance with county plans.

Surface Mining Law

This law requires that every strip mine operation be approved by the State Department of Natural Resources and that in filing an application for a permit to undertake strip mining, a mining and reclamation plan be

submitted to the Department. If the operator of a strip mine fails to comply with this statute, a license to operate may be denied. Permits are not issued to past violators of the strip mine law. Bonds required are at the rate of $300 per acre with a $3,000 minimum and a separate revegetation bond is required which ranges from $50 to $120 an acre. The bond is released when the planned reclamation and revegetation has been completed. In addition, the state charges a $100 license fee plus $10 per year for renewing stripping licenses and also charges a reclamation fee of $ 30 an acre. This amount is matched by a state appropriation and is used to reclaim abandoned mines. Both civil and criminal violations are incorporated in this strip mining law.

PENNSYLVANIA

Clean Streams Law

The Sanitary Water Board of Pennsylvania was created by the clean streams law and has the responsibility for developing water policy within the Commonwealth. The Board also has the authority for developing standards, policies and plans for effective water quality control and water quality management throughout the Commonwealth. The clean streams law requires that no municipality shall discharge sewage into any of the waters of the Commonwealth without a permit issued by the Department of Environmental Resources. If the Sanitary Water Board finds that discharge by a municipality constitutes a public health nuisance, the Department may order a municipality to repair or build an effective sanitary sewage system. The clean streams law also provides authority to the Board to approve plans and designs for municipal systems and provides that the municipalities may use revenue bonding authority for financing municipal systems.

The clean streams law also prohibits the discharge of industrial wastes without a permit. It charges the Board with undertaking a survey of the waters within the Commonwealth to determine the extent of pollution and calls upon the Board to undertake research to determine feasible ways for the abatement of industrial waste discharges. The Department retains the right to approve plans, designs and other relevant data that is submitted in conjunction with a plan by an industry to abate its pollution. The clean streams law requires operators of mines to include backfilling in the case of strip mining and sealing in the case of deep mines so that there will be no discharge or drainage after the mining operation is ceased. The clean streams law provides enforcement authority and civil penalties when the law is violated. Pennsylvania also operates a fund for preventing acid mine drainage from abandoned mines. This fund has a total bonding authority of $200 million and is being used at the rate of about $20 million a year.

Air Pollution Control Law

The Department of Environmental Resources was given authority for enforcing air pollution control standards throughout the Commonwealth. The air pollution control law also created the Air Pollution Commission. The Commission has the responsibility for defining air pollution regions throughout the Commonwealth and for drafting rules and regulations for the control of air pollution. The law also created regional air pollution control associations. These associations have the responsibility for reviewing and commenting upon all proposed regulations issued by the Commission and to consider complaints regarding air pollution within its region. The regional air pollution associations were charged with using conciliation and persuasion in an attempt to resolve complaints they receive. They are also

urged to cooperate with the appropriate entities in their region to develop a program for the prevention, abatement, and control of air pollution. The air pollution control law provides civil penalties for violation of the law and assigns responsibility for enforcement of the law to the Department of Environmental Resources.

Solid Waste-Management Law

This law authorized the Department of Environmental Resources to establish and maintain a cooperative state and local program of planning and technical assistance and financial assistance for comprehensive solid waste management. The law requires that each municipality with a population density of 300 or more inhabitants per square mile shall submit to the Department an officially adopted solid waste management plan. The law sets forth the elements to be included in this plan and provides that municipalities may join together to develop joint solid waste management programs. The law authorizes the Department of Environmental Resources to adopt rules, regulations and standards as shall be necessary to maintain a high-quality of solid waste management. The Department is also required to develop a state-wide solid waste management plan and carry out research and demonstration projects pertaining to solid waste management systems. Prohibited acts are enumerated in the law and procedures for obtaining permits to dispose of solid waste are set forth. Special regulations are established for the disposal of solid waste in abandoned mines.

Surface Mining Law

The surface mine law requires that any operator must obtain a permit prior to the beginning of surface mine operations and that a plan be submitted which describes how reclamation will be carried out after the

stripping operation has been completed. A license to conduct stripping operations may be denied an operator if he fails to comply with the surface mine statutes, and permits for operating a surface mine will not be issued to past violators. The surface mine law requires that a bond of between $500 and $1,000 an acre be obtained prior to the beginning of operation with a minimum $5,000 bond. All but $100 an acre may be released after the backfilling has been completed and approved and the remainder released when replanting has been completed. The license fees are $300 per year. Both civil and criminal penalties may be assessed for violation of the surface mining law.

Coal Mine Subsidance Laws

Homeowners within the Commonwealth who suffer from the problems caused by subsidance of land over deep mined areas can obtain insurance to protect themselves against the losses they may suffer from this subsidance. In addition, the Department of Environmental Resources is charged with not approving any plans for deep mining which will cause damage to surface structures if adequate support of the subsurface character of land is not maintained.

WEST VIRGINIA

Water Pollution Control Law

The State Water Resource Board was created by the Water Pollution Control law and was given the responsibility for planning a comprehensive water resource program for the state and also developing a program whereby domestic sewage and industrial and other wastes are controlled. The law also gives the Board the authority to adopt and promulgate water quality standards and develop a system whereby any effluent into a natural waterway shall be covered by a permit which is obtained from the Water Resource Board. The water pollution control law also gives the Board authority to carry out inspections and enforce water quality standards set by the Board. The law encourages volunteer water quality monitors and establishes a program whereby such monitors can be organized by the Board. The Board is given the authority for enjoining a polluter from continuing the pollution and may issue emergency cease and desist orders where domestic drinking water is affected or the public health of an area is endangered. The state also has an abandoned mine reclamation fund to reduce acid mine drainage from abandoned mines. This fund is financed by a fee charged to strip mine operators.

Air Pollution Control Law

The West Virginia Air Pollution Control Commission was created by the Air Pollution Control Law and is a separate entity in the state. It has full authority for the air pollution abatement program. The Commission has the authority to adopt and promulgate rules and regulations, carry out inspection and enforcement activities to and respond to complaints. The Commission is also charged with making appropriate rules for the control of emissions from motor vehicles when technology increases to the extent that such regulations may be effectively enforced.

Solid Waste Law

The State Department of Health is charged with regulating solid waste disposal within the State. The standards for sanitary landfills are promulgated by the Health Department and the municipalities are given authority to undertake solid waste disposal programs using local tax funds.

It should be noted that several legislative proposals have been made to the West Virginia legislature for more extensive solid waste disposal programs and passage of one or more of these bills is expected.

Surface Mining Laws

Permits are required for any surface mining activity undertaken in the State. Permits are not issued to past violators and no permit is issued where sediment and acid mine drainage cannot be feasibly prevented. The law also prohibits for two years stripping operations in counties where no operations were lawfully undertaken in 1970. A $600 to $1000 per acre bond is required with a minimum bond amount of $10,000. A permit fee of $100 is charged plus $50 a year to renew. A special fee of $60 per acre is also charged which is used to reclaim abandoned mine areas. An amount equal to $150 per acre is withheld until two years after replanting has occurred to insure that the vegetation has taken and erosion has been abated. Civil and criminal penalties can be levied for violations of the Surface Mining Statute

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WEST VIRGINIA

Water Pollution Control Law

The Division of Water Resources was created by Chapter 20 which formed the Department of Natural Resources which assigned the Division of Water Resources the responsibility for planning a comprehensive water resources program for the state and also for the development of a program whereby domestic sewage and industrial and other wastes are controlled. The law gives the Water Resources Board the authority to adopt and promulgate water quality standards as well as act as an appeal body for actions taken by the Chief of the Division of Water Resources. A permit from the Division of Water Resources is required for any discharge into waters of the State. The water pollution control law also gives the Chief authority to carry out inspections and enforce water quality standards set by the Board. The law encourages volunteer water quality monitors and establishes a program whereby such monitors can be organized, trained, and appointed by the Chief. The Chief is given the authority for enjoining a polluter from new or continuing pollution and may issue emergency cease and desist orders where domestic drinking water is affected or the public health of an area is endangered.

Air Pollution Control Law

The West Virginia Air Pollution Control Commission was created by a 1961 Legislative act and is a separate state agency. It has full authority for the air pollution abatement program. The Commission has the authority to adopt and promulgate rules and regulations, carry out inspection and enforcement activities to and respond to complaints. The Commission is also charged with making appropriate rules for the control of emissions from motor vehicles when technology increases to the extent that such regulations may be effectively enforced.

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Solid Waste Law

The State Department of Health is charged with regulating solid waste disposal within the State. Regulations on solid waste disposal and the standards for sanitary landfills are promulgated by the State Board of Health. The municipalities and county courts are given authority to undertake solid waste disposal programs using local funds.

It should be noted that several legislative proposals have been made to the West Virginia legislature for more extensive solid waste disposal programs and passage of one or more of these bills is expected.

Surface Mining Laws

Permits are required for any surface mining activity undertaken in the State. Permits are not issued to past violators and no permit is issued where sediment and acid mine drainage cannot be feasibly prevented. The law also prohibits for two years stripping operations in counties where no operations were lawfully undertaken in 1970. A $600 to $1000 per acre bond is required with a minimum bond amount of $10,000. A permit fee of $500 is charged plus $100 a year to renew. A special of $60 per acre is also charged which is used to reclaim abandoned mine areas. An amount equal to $250, minimum $5000, per acre is withheld until two years after replanting has occurred to insure that the vegetation has taken and erosion has been abated. Civil and criminal penalties can be levied for violations of the Surface Mining Statute.